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ABSTRACT

This is a collection of the first 13 units (primary-intermediate levels) of materials designed for the Conceptually Oriented Mathematics Program (COMP). The program is intended to diagnose student difficulty, provide a prescriptive program of improvement, and meet individual needs through small-group instruction. Content has been organized into 11 broad concept areas: sets, numerals, order, addition, subtraction, multiplication, division, functions and graphs, geometry, measurement, and number sentences and phrases. These areas are then fitted into 25 vertical levels, each level having two or more steps. The material actually contained here is a collection of lesson outlines covering most concept areas at most levels. Each lesson has the following format: concept area, behavioral objective, mathematical ideas, vocabulary, activities, references, and worksheets. Teaching aids are also suggested. (LS)

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CONCEPTUALLY ORIENTED MATHEMATICS PROGRAM [LEVEL 1 - 13]

A Title III Project

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developed and produced

by

Columbia Public Schools

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SE 019 046

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CONCEPTUALLY ORIENTED MATHEMATICS PROGRAM
(COMP)

The initials COMP call to mind the idea of something being "comprehensive." This definition is, indeed, quite fitting for our COMP (Conceptually Oriented Mathematics Program), provides a comprehensive program designed to meet individual needs in mathematics through small group instruction.

The Conceptually Oriented Mathematics Program, is a management program that is both diagnostic and prescriptive. Students are tested to determine their individual strengths and weaknesses and are grouped accordingly. The program provides continuous progress until the student is ready for algebra. The major areas of concern are today's subject-centered curriculum which fails to recognize individual differences of students and the self-contained classroom organization which encourages students to fit textbook molds. COMP is designed to adhere to the learning needs of the individual.

To support the classroom teacher in her role as classroom manager rather than lecturer the following materials were developed by selected classroom teachers in the Columbia Public Schools: A Scope and Sequence Chart, Teacher's Guide Books, Placement Tests, Post Test I and II, Individual Profile Sheets.

The Scope and Sequence Chart is the visual organization of the Conceptually Oriented Mathematics Program. Ten broad concept areas are developed vertically through twenty-five levels of complexity. Each level has been broken down into two or more steps. The inclusion of Step Z in a level provides topics for horizontal enrichment. The Scope and Sequence Chart serves to give the instructor a better understanding of the total program and as an outline to be followed in planning the instruction for a particular level. Instruction in each level may be planned around either horizontal or vertical progress through a given level.

The Teacher's Guide Books serve as a handbook for teachers. The instructions and suggestions in the manual were developed to supplement the teacher's knowledge of mathematics and to relieve her of some of the pressures involved in finding appropriate activities for concept development. It is the intent of the program to stimulate creativity in the classroom and to discourage rote learning. A complete lesson has been prepared for each concept presented. Each lesson has the following format:

The concept
The behavioral objective
The mathematical Ideas
Vocabulary
Activities
Textbook References - Houghton Mifflin
Addison-Wesley
Worksheets
Other references: Film Strips
Commercial Tapes
Enrichment Books

Suggested activities for developing and reinforcing concepts are included. Textbook references include multiple grade levels for each reference and the number of the corresponding ditto master is in parenthesis following each listing of page numbers. While the student is progressing through a level the teacher is offering guidance and using innovative teaching aids suggested in the manual.

EVALUATION AND IMPLEMENTATION

I. Types of Tests

The diagnostic and evaluative part of this program is based on two types of tests:

A. Placement Tests were developed to determine the level of competency which a student has achieved in each of the ten concept areas. The placement tests consists of ten multiple choice test items for each stated behavioral objective in a given level. The placement test results are marked on the profile sheets. The results of the placement test will be the basis for forming the initial instructional groups. Tests for Levels 1-6 stress basic facts and will not have multiple choice answers.

B. Post Tests were developed to test the competency of the students after completing the work in a given level. The tests basically consist of five problems for each stated behavioral objective in a given level. Space is provided on the post test for the student to show his work. Students will be retaught those concepts in which they did not achieve 80 percent mastery for a given behavioral objective. Following this period of instruction, the second post test will be given over those concepts which have been retaught. It is recommended that a student does not begin a new level until his profile sheets indicates mastery of 80 percent of the behavioral objectives on the present level.

II. Placement

Begin testing those students new to the program at these recommended levels.

Grade 1	Level 1	(Optional)
Grade 2	Level 2	
Grade 3	Level 4	
Grade 4	Level 6	
Grade 5	Level 9	
Grade 6	Level 11	
Grade 7 & 8	Determined by the individual school.	

All students who pass their initial test should continue with the testing until the level of competency has been determined for each child.

Those students who were not proficient on the initial test should be given the preceding tests until their level of proficiency is determined.

III. Profile Sheets

A. Mark with a red X all concepts passed on the placement tests.

B. Mark with a blue X all concepts passed on Post Test I which is given after teaching the level.

C. Reteach any concepts in which the student did not achieve 80 per cent proficiency.

D. Mark with a blue X the results of Post Test II which is given after reteaching any concept not passed on Post Test I.

E. Indicate each years accomplishments by drawing a line after the last level completed that year and writing the year this work was completed.

F. The slash marks indicate that a concept was not taught in the level.

Students who have been in the program the previous year will be given the Placement Test for the last level completed the previous year. This test is given to determine the students who need review before continuing to the next level. The teacher determines the amount of time and the assignments needed for review. A Post Test should be given as soon as the teacher thinks the student is ready to proceed to a new level.

Instruction Materials and Manipulative Aids

The following materials are available in each building unless marked with an asterisk. These should be ordered through the Mathematics Office on the pink sheet available in your building.

I. Audio-Visual Equipment

Tape Recorders.
Audio-Pacers.
Tapes:

* A. Imperial International Learning Tapes: Primary
B. Imperial International Learning Tapes: Intermediate
C. COMP Tapes (project Tapes)
* D. Continuous Progress Laboratory--Series 500.
* E. Blank Tapes - for teacher made tapes

* Filmstrips - Curriculum series.

362 - Introduction to Plane Geometry
363 - Vocabulary: Lines and Angles I
364 - Vocabulary: Lines and Angles II Relationships
365 - Lines, Relationships, Direction
366 - Vocabulary - Triangles
367 - Polygons - Geometry
368 - Geometry Circles I
369 - Vocabulary Circles II
373 - Geometry in Art

Filmstrips - and Cassettes Forms We See

EF 1106 - 1 Circles
EF 1106 - 2 Triangles
EF 1106 - 3 Quadrilaterals
EF 1106 - 4 Polygons
EF 1106 - 5 Solid Figures

II. Teaching Aids.

Concept and Skill Cards.
Number Lines:

Demonstration size.
Transparent: centimeters
Individual.

Geometric Shapes (small)

* Geometric Shapes (large)

Counters.
Attribute Blocks.
Open-End Abacus.
Base Ten Blocks

II. Teaching Aids. (Continued)

Multi-Base Blocks.
Colored Centimeter Rods.
Primary rulers.
Meter stick.
Fractional Parts: Felt
Clock Faces.
Flannel Boards and Cut-Outs.
Cubit Foot.
Chalkboard Compass.
Cross Numbers I & II
Arithmablocks
Addition/Subtraction Math Path
Addition/Subtraction Bingo
Motivators - Number Sequence
Motivators - Number Puzzler
Mirror Cards
Sum Fun
Smarty
Geoboards
Winning Touch
Tell Time Quizmo
* Action Fractions Squares and Triangles
Math Match
Tangrams
Prime Drag
Liquid Measure Game

III. Reference Materials: Books.

A. Franklin Series.

1. Mirror Magic
2. Learn to Fold.
3. Paper and Pencil Geometry
4. Making and Using Nomographs.
5. Learning about Measurement.
6. Mathematics Around the Clock.
7. Patterns and Puzzles in Mathematics.
8. Probability: The Science of Chance.

B. Mathematics in the Making Series.

1. Patterns, Areas, and Perimeters.
2. Binary and Other Number Systems.
3. Looking at Solids.
4. Rotation and Angles.
5. Curves.
6. Scale Drawing and Surveying.
7. Transformations and Symmetry.
8. Networks.

C. Scholastic Self-Teaching Arithmetic Books.

D. Let's Play Games in Mathematics.

III. Reference Materials: Books: (Continued)

- * E. Metric Measurement, Minneapolis Public Schools
- * F. Introducing the Metric System, Educational Methods, Inc.
- * G. Flowcharting, McQuigg and Harness, Houghton Mifflin

SCOPE AND SEQUENCE CHART

	SETS	NUMERAL	ORDER	ADDITION	SUBTRACTION	MULTIPLICATION	DIVISION	FUNCTION	GEOMETRY	MEASUREMENT
Level 1 Step A	Recognizing the members of a set	Cardinal number (0-6)							Identifying common geometric shapes	
Step B	Comparing sets	Cardinal number (7-10)	Comparing numbers 0-10 "<" "=" ">"	Sums to 6	Finding the missing addend to 6					
Step C	Separating sets (subsets)		Ordinals to 10							Money: penny nickel dime
Level 2 Step A		Place value 10-99	Ordered numbers 10-99	Sums 7-10	Finding the missing addend 7-10				Sets of points	Time: hour
Step B		Odd and even numbers	Comparing numbers 10-99 "<" "=" ">"	three one-digit addends						Linear measure: non-standard units
Level 3 Step A				Sums to 12	Finding the missing addend to 12			Introducing picture and bar graphs		Linear measure: inch
Step B		$\frac{1}{2}$, $\frac{1}{4}$ (region)		Expanded notation						Time: half-hour
Step C				Two digit addends (basic facts to 9)	Finding the missing addend with 2 digit numbers					Linear measure: half-inch

SCOPE AND SEQUENCE CHART

	SETS	NUMERAL	ORDER	ADDITION	SUBTRACTION	MULTIPLICATION	DIVISION	FUNCTION	GEOMETRY	MEASUREMENT
Level 4 Step A			Ordinals through 10 with words	Basic facts sums 13-15	Missing addends sums 13-15			Forming number pairs when rule is given	Line properties	Money: counting to 50 cents
Step B		Place value to 399	Ordinals 100-999	Word Problems using basic facts 13-15				Determining the rule involving addition and subtraction		Liquid measure: cup, pint, quart
Level 5 Step A		Extending place value to 999	Comparing numbers 100-999 "<" "=" ">"	Basic facts sums 16-18	Missing addends sums 16-18	2 as a factor	2 as a factor			Money: making change up to 50 cents
Step B	Equivalent subsets	Recognizing and naming $\frac{1}{2}, \frac{1}{4}$ (sets)		Word Problems using basic facts 16-18		5 as a factor	5 as a factor	Number plane		Time: quarter-hour
Level 6 Step A				Addends 2 or 3 digit no renaming	Missing addends 2 or 3 digit no renaming	3 as a factor	3 as a factor			Liquid measure: gallon half-gallon
Step B		Recognizing and naming $\frac{3}{4}, \frac{1}{3}, \frac{2}{3}$ (regions or sets)	Fractional numbers on number line	Renaming 2 and 3 two-digit addends	Renaming two-digit missing addends	4 as a factor	4 as a factor			Money: counting to $1.00
Step C		Properties of 0 and 1		Word Problems renaming		Word Problems (2-5 as factors)	Word problems (2-5 as factors)			Money: making change up to $1.00

SCOPE AND SEQUENCE CHART

	SETS	NUMERAL	ORDER	ADDITION	SUBTRACTION	MULTIPLICATION	DIVISION	FUNCTIONS AND GRAPHS	GEOMETRY	MEASUREMENT
Level 7 Step A	Commutative principle (addition)	1000-9999	Comparing numbers 0-9999 <, >, =	3 digit with renaming	3 digit with renaming	6-7 as factors	6-7 as factors		Rays, planes curves	
Step B	Associative principle (addition)			3 digit addends with renaming Word Problems	3 digit addends with renaming	6-7 as factors Word Problems	6-7 as factors		Angles Parallel lines	Linear Measure: $\frac{1}{4}$ inch
Level 8 Step A	Commutative principle (multiplication)					8-9 as factors	8-9 as factors		Parallelogram quadrilateral square rectangle triangle	Time: 5 minutes
Step B	Distributive principle common factors	Rational numbers - fractions $\overline{5}, \overline{6}, \overline{8}$	Comparing fractions $\overline{5}, \overline{6}, \overline{8}$ <, >, =			8-9 as factors Word Problems	8-9 as factors		Area Measurement	Linear Measure: foot, yard Dozen
Step C		10,000 to 9,999,999	Comparing numbers 10,000 to 9,999,999 <, >, =			Multiples	Factors			
Level 9 Step A	Solving two-stage word problems	Even and odd numbers (2-n places)				2-digit factors by a 1-digit factor with or without renaming	2 digit product with 1 digit factor with or without remainder	Number pairs (involving all operations)	Circles radius diameter	Time: problem solving
Step B	Associative principle (multiplication)	Roman Numerals I to L				Word Problems with a 1-digit factor and 2 digit factor or product		Naming number pairs on a graph	Recognizing spheres cylinders cubes	Money: (making change up to $10)

SCOPE AND SEQUENCE CHART

	SETS	NUMERAL	ORDER	ADDITION	SUBTRACTION	MULTIPLICATION	DIVISION	FUNCTIONS AND GRAPHS	GEOMETRY	MEASUREMENT
Level 10 **Step A**	Fractional numbers equaling 1	Equivalent fractions using identity element 1		Fractions with like denominators	Fractions with like denominators	3 or 4 digit factor by 1 digit factor	3 or 4 digit product by 1 digit factor with or without remainder		Symmetry	
Step B	Set notations "∪", " n()" "{}"	Place value through billions		Word Problems using fractions with like denominators		Word Problems for Step A			Properties of line segments: Intersecting congruent perpendicular	Temperature degree
Step Z	Cross Product	Roman Numerals C, D, M		Reconstruction Problems						
Level 11 **Step A**	Intersection of sets "∩" Venn diagrams	Common factors		Fractions renaming sum or addend		Two 2-digit factors	3-digit product by 2-digit factor without remainders	Linear and bar graphs	Properties of planes	Average Range
Step B	Finite Infinite	Composite & prime numbers	Solution sets for inequalities			Word Problems for Step A		Function rules written in equation form		Weight: ounces pound ton
Level 12 **Step A**	Statements of disagreement	Mixed numerals	Comparing any fractional number <, >, =	Column 4-6 digits	4-6 place with renaming	3-digit factor by 2-digit factor	3-digit product by 2-digit factor with remainders	Naming number pairs with two operations	Properties of closed surfaces: pyramid cylinder cone	Linear measure: $\frac{1}{8}$ inch
Step B	Statements of deduction	Exponents		2-stage word problems using all 4 operations					Volume: cubic unit	Linear measure: centimeter
Step Z	Abstract Mathematical system	Base 3 and 4		Clock arithmetic						

SCOPE AND SEQUENCE CHART

	SETS	NUMERAL	ORDER	ADDITION	SUBTRACTION	MULTIPLICATION	DIVISION	FUNCTIONS AND GRAPHS	GEOMETRY	MEASUREMENT
Level 13 Step A	Naming the LCM using intersection			Fractions with unlike denominators	Fractions with unlike denominators		4 digit dividend with 2 digit divisor		Identifying pentagons and hexagons	Linear measure: (mm, cm, dm, m, km.)
Step B	Naming the GCF using intersection	Prime factorization with factor trees		Fractional numerals: one addend greater than one	Mixed numerals without regrouping	Word problems with n-digit factors	Applying the divisibility rules for 2, 3,4,5,6,9,10		Naming the perimeter of a polygon	Finding the median
Level 14 Step A				Denominate numbers	Denominate numbers	Whole number by a unit fraction	Multiplying by a reciprocal		Naming the line of symmetry	Using a protractor to measure angles
Step B	Comparing Cardinal number of 2 disjoint sets as a rate or ratio					Whole number by a fraction < 1		Locating a point on a number plane using a number pair	Identifying similar and congruent shapes	
Step C						Both factors < 1			Area of square, rectangle, parallelogram	
Step Z				←— FLOW CHARTS —→						
Level 15 Step A	Expressing Probability as a fractional number	Base 5		Mixed numerals with regrouping	Fraction from whole number	Whole number by a mixed numeral			Surface area and volume of a rectangular prism	
Step B		Decimals in tenths and hundredths		Decimal addends in tenths and hundredths	Decimals in tenths and hundredths	Decimal products to hundredths			Identifying and constructing arcs and chords	
Step Z				Addition in Base 5	Subtraction in Base 5					

	SETS	NUMERAL	ORDER	ADDITION	SUBTRACTION	MULTIPLICATION	DIVISION	FUNCTIONS AND GRAPHS	GEOMETRY	MEASUREMENT
l 16 Step A		Writing equations and inequalities for word problems	Rounding whole numbers		Mixed numerals with renaming	Mixed numeral times a mixed numeral	Mixed Numerals	Functions with fractions		
Step B	Graphing solution sets on the number line	Base eight					Five digit dividend with two place divisor (standard form)	Graphing function equations	Classifying polygons	
Step Z		Hebrew numerals (introduce)		Roman numerals		The lattice method				
l 17 Step A		Prime factorization by dividing				Clock arithmetic	Square root (estimating)	Using formulas (solve for unknown		Area of triangle	Metric system (units of weight)
Step B	LCM and GCF by Prime Factorization	Base two (introduce)		Base two		Base two			Pythagorean Theorem	
Step Z	Developing the idea of a "perfect" number				Checking by casting out nines					
l, 18 Step A		Decimals to thousandths (introduce)		Decimals to thousandths	Decimals to thousandths	By powers of 10				
Step B		Introducing integers		Integers on number line	Integers on number line	Decimal fractions	Decimal fractions		Circumference of circle	
Step C		Renaming fractions as a percent				Finding the percent of a whole number			Area of a circle	
Step Z		Locating rational numbers on numberline				Profit and loss (percent)				

SCOPE AND SEQUENCE CHART

	SETS	NUMERAL	ORDER	ADDITION AND SUBTRACTION	MULTIPLICATION	DIVISION	FUNCTIONS AND GRAPHS	GEOMETRY	MEASUREMENT	NUMBER SENTENCES & PHRASES
Level 19 Step A	Extending set terminology $(\in, \notin, \phi, \subset, \not\subset)$	Converting terminating decimals to fractions	Rounding decimals	Properties (commutative, associative, distributive)		Decimals (rounding quotients)		Relating set operations to geometric figures	Measuring to the nearest unit	Simplifying expressions (whole numbers)
Step B		Converting fractions to terminating or repeating decimals	Ordering decimals			Relating fractions, decimals & percents				Simplifying expressions (fractional numbers)
Step Z		Converting repeating decimals to fractions							Finding measurement using greatest possible error	
Level 20 Step A			Comparing fractional numbers (using the comparison property)					Separating lines, planes and spaces	Metric system (units of capacity)	Solving proportions
Step B			Solving fractional inequalities (using the comparison property)					Related angles		Percent problems
Step C								Degree measure without a protractor		Word problems using proportion
Step Z		Base 12							Constructing circle and divided bar graphs	

SCOPE AND SEQUENCE CHART

	SETS	NUMERAL	ORDER	ADDITION AND SUBTRACTION	MULTIPLICATION	DIVISION	FUNCTIONS AND GRAPHS	GEOMETRY	MEASUREMENT	NUMBER SENTENCES & PHRASES
Level 21 Step A				Integers (without using number line)	Integers	Integers	Graphing integers on a number line using inequalities	Extending the classification of triangles	Statistical averages	Simplifying expressions using integers
Step B							Graphing ordered pairs of integers on a plane	Area of a trapezoid		Word problems (commission, interest, discount
Step Z		Roman Numerals				Euclidean Algorithm		Vectors	Frequency distributions	Solving consumer problems
Level 22 Step A		Nogative rationals	Comparing rational numbers					Transversals and parallel lines		Number phrases
Step b		Opposites (rational numbers)	Using the symbols $\not<, \not>, \not\leq, \not\geq$					Ruler and compass constructions		Evaluating open number phrases
Step C		Absolute value		Rational numbers	Rational numbers	Rational numbers				Using replacement set to find solution set
Step D	Closure									Solving equations by inspection (rational numbers)
Step Z	Set-builder notation	Greatest Integer notation	Sets: Just for fun	Sets: beginning logic			Probability: simple experiments	Networks		

SCOPE AND SEQUENCE CHA

	SETS	NUMERAL	ORDER	ADDITION AND SUBTRACTION	MULTIPLICATION	DIVISION	FUNCTIONS AND GRAPHS	GEOMETRY	MEASUREMENT	NUMBER SENTENCES & PHRASES
Level 23 Step A					Using exponents	Using exponents		Congruent triangles (SAS, ASA, SSS)		Solving equations using addition property of equality
Step B		Negative and zero exponents			Using integral exponents	Using integral exponents		The 5 regular polyhedrons		Solving equations using multiplication property of equality
Step C		Scientific notation			Using scientific notation	Using scientific notation		Classifying prisms	Extending conversions within the metric system	Translating word sentences into number sentences
Step D		Significant digits						Surface area & volume of pyramids & prisms	Converting to metric units of length	Using equations in one variable
Step Z	Logic - Using truth tables	Fractional exponents		Using exponents			Probability: combined events	Euler's formula		Equations with absolute value
Level 24 Step A	Develop set of real numbers	Changing repeating decimals to fractions	Comparing real numbers	Rational approximations				Parts of cones, cylinders, & spheres	Metric units of area	
Step B			Density				Graphing real numbers	Surface area of cones, cylinders, & spheres	Metric units of volume	
Step C							Domain, range, & function	Volume of cones, cylinders, & spheres		Solving inequalities in 1 variable
Step Z	Logic - Extending operations on sets						Empirical probability	Point of symmetry		Compound inequalities

SCOPE AND SEQUENCE CHART

	SETS	NUMERAL	ORDER	ADDITION AND SUBTRACTION	MULTIPLICATION	DIVISION	FUNCTIONS AND GRAPHS	GEOMETRY	MEASUREMENT	NUMBER SENTENCES & PHRASES
Level 25 **Step A**		Reading radical expressions	Using order to estimate square roots					Solving right triangles		Solving equations in 2 variables
Step B		Square root by "divide& average" method					graphing linear equations in 2 variables		Metric units of mass and capacity	Solving inequalities in 2 variables
Step C		Square root by the Algorithm method					Graphing linear inequalities in 2 variables			
Step D		Square root using tables					Graphing systems of linear equations			
Step Z	Logic - Using quantifiers	Square root & the sum of odd numbers					Permutations and combinations	Trigonometry		Implication and proofs

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Level 1

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3. Geometry: Identifying common geometric shapes. 1-6

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3. Order: Comparing numbers 0-10 "<", " = ", ">". 1-16
4. Addition: Sums to six. 1-22
5. Subtraction: Finding the missing addend to six 1-27

Step C

1. Sets: Separating sets (subsets). 1-30
2. Order: Ordinals to 10. 1-34
3. Measurement: Money: penny, nickel, and dime 1-38

Answers to Worksheets 1-39

Level: 1 Step: A Concept: Sets

I. Concept:

Sets: Recognizing the members of a set.

II. Behavioral Objective:

The student given an example of a set will be able to identify a member of that set.

III. Mathematical Ideas:

The members of a set must be so well defined that there will be no problem in recognizing them.

IV. Vocabulary to Stress:

set members ring

V. Activities:

A. Ask the children to find sets in the room: windows, girls, boys, teachers, books, pictures, etc. Don't forget the empty set.

B. Place a variety of objects on the flannel board. Name a set and have a student remove all objects except those in the set. Name another set and have a student use yarn to ring those objects.

C. Have the children fold newsprint twice to form four sections. Then draw a set or cut and paste a set in each section. Be sure to have the children draw a ring around each set.

D. "Let's Play Games in Mathematics" Vol. 1. Game 37 - Adapt

Text References:

Book: 1

Houghton Mifflin (1967) pp. 1, 2.
Houghton Mifflin (1972) pp. 5, 6

Book: 2

Houghton Mifflin (1967) p. 2

Other References:

Countdown #1

Level: 1 Step: A Concept: Numeral

I. Concept:

Numeral (Cardinal number 0-6): Counting a set to determine the cardinal number.

II. Behavioral Objective:

The student given a set of 0-6 objects will be able to count the objects and write the cardinal number of the set.

III. Mathematical Ideas:

A. A set can be identified with the cardinal numbers 0-6.

B. The cardinal number of a set names the number of members in a set.

IV. Vocabulary to Stress:

zero	four	how many	name for a number
one	five	number	empty set
two	count	numeral	order
three	six		

V. Activities:

* A. Count objects around the room--children, desks, tables, lights, windows, etc.

* B. Ask the children to fold a large sheet of newsprint in four sections. Give oral or written (on board) directions such as: Draw a set of 3 blue balls. Draw a set of 2 red boats, etc.

C. Use example on page 1-4.

* D. Start a number book for each child by stapling newsprint together to make 11 pages. As each number is introduced have the child make a set and numeral on each page. (Don't forget the zero.)

E. Draw 7 circles the size of paper plates on the board and put 0-6 in them. On 2 paper plates have each child draw a different set (the teacher could assign this). Pass out several empty set plates. The teacher points to a numeral on the board. The children with that set stands up and the teacher calls on one person to tell the name of the numeral. After playing several times, exchange plates.

F. Have a row of children come to the blackboard. Another child calls out a numeral, and everyone writes it. Children at their seats may use pencil and paper and join in the game.

Level: 1 Step: A Concept: Numeral

Activities: (Continued)

G. Divide the class into two sets. Have the first child in each set go to the board. The teacher calls out a numeral. The children at the board each write the numeral on the board. The child who writes it correctly first puts a point up for his side. Then the next two children go to the board. The game continues until all have had a chance. The side with the most points wins.

H. Songs on page 1-5.

I. "Let's Play Games in Mathematics" Games 22, 51, 106, 111 (Adapt)

J. Place a set of Houghton Mifflin set cards and a set of numeral cards face down. Have each student pick both a set card and a numeral card and (1) name the numbers, (2) tell whether or not they match, and, if not, (3) which shows the greater number. (2 and 3 could be used later, after order and "<" ">" have been taught.)

K. The students may be given five counters each. They play in pairs and take turns putting out a set, saying "Match my set". The partner must say the numeral for the set as he puts out his matching set. They should be encouraged to arrange their sets in different patterns.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 11, 12 (1), 13-21 (2,3) 22-28, 31
Houghton Mifflin (1972) pp. 13-32 (1, 2, 3, 4)
Addison-Wesley (1971, 1968) pp. 11-18 (1, 2, 3) 19-22, 35-40, (10)

* Modern Mathematics filmstrip #700

The children will learn to identify the number of objects in a set of four or less and write the corresponding numeral. They will learn the order of the numbers zero through four.

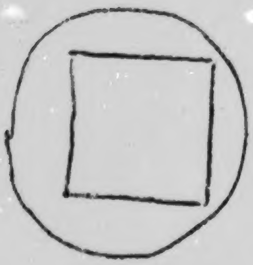
*Suggested Introductory Activities.

Level: 1 Step: A Concept: Numeral

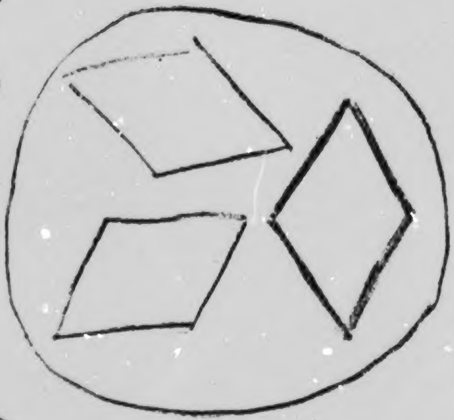
Activity C Name______________________________

Sets of 1 - Blue
Sets of 2 - Red
Sets of 3 - Green
Sets of 4 - Orange

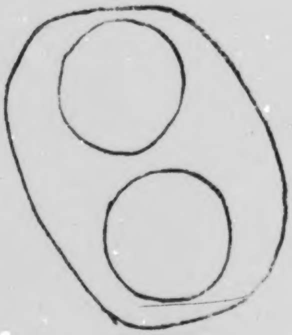
(1)



(2)



(3)



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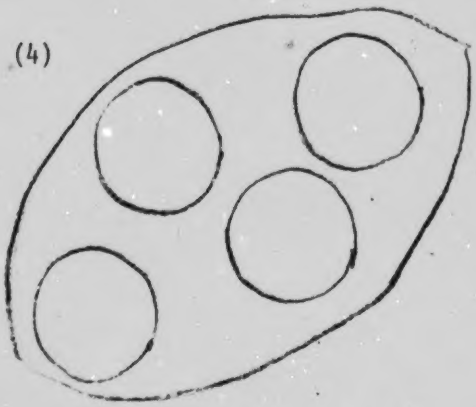
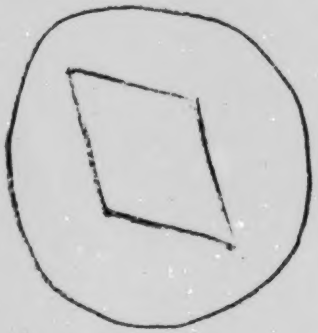
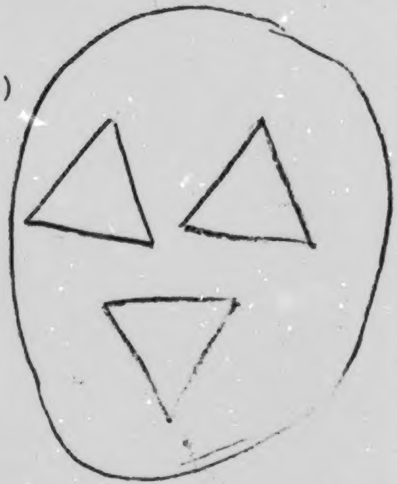


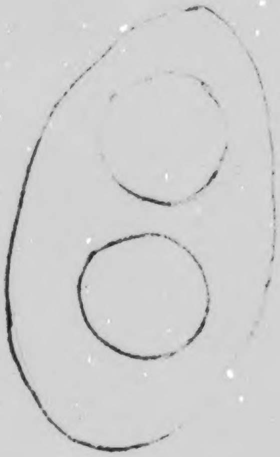
(5)



(6)



(7)



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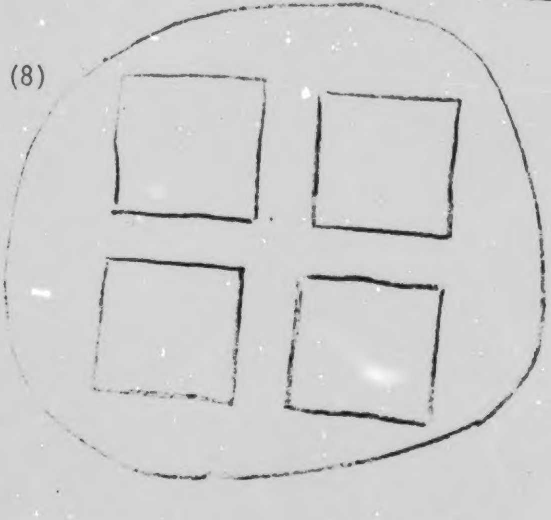
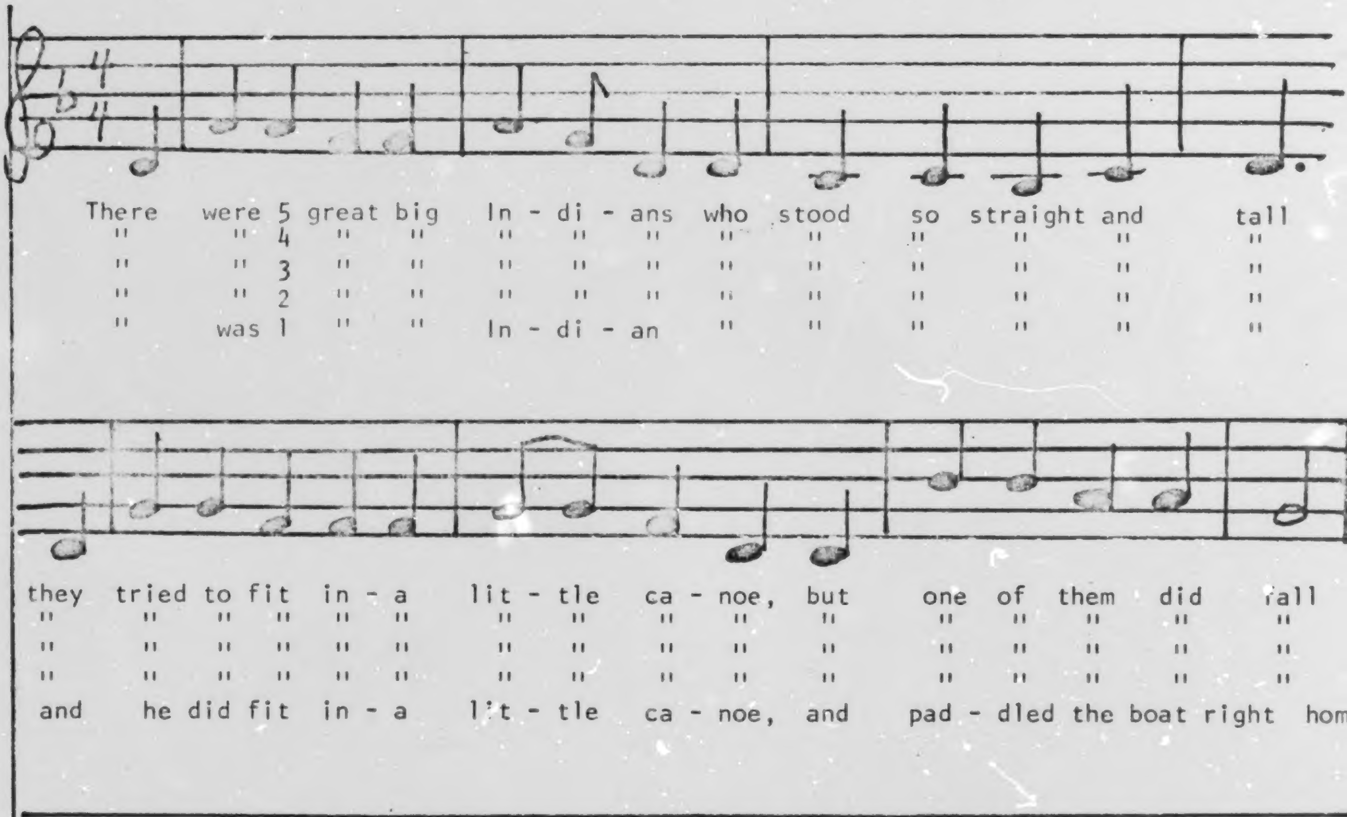


Level: 1 Step: A Concept: Numeral

Activity H


There were 5 great big In - di - ans who stood so straight and tall
" " 4 " " " " " " " " " " "
" " 3 " " " " " " " " " " "
" " 2 " " " " " " " " " " "
" was 1 " " In - di - an " " " " " "
they tried to fit in - a lit - tle ca - noe, but one of them did fall
" " " " " " " " " " " " " " " "
" " " " " " " " " " " " " " " "
" " " " " " " " " " " " " " " "
and he did fit in - a lit - tle ca - noe, and pad - dled the boat right hom

Use the song "Five Little Chickadees"

from the Folkraft record 1184

Level: 1　　Step: A　　Concept: Geometry

I. Concept:

Geometry: Identifying common geometric shapes.

II. Behavioral Objective:

The student given a square, circle, triangle, and rectangle will be able to name the shape.

III. Mathematical Ideas:

A. Squares, circles, triangles, rectangles are all special closed curves.

B. The points inside the curve form a region.

C. The region is described by the shape of its boundary.

D. Figures of the same size and shape are congruent.

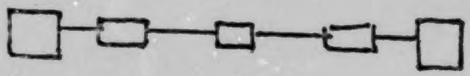
IV. Vocabulary to Stress:

square
circle
triangle
rectangle
region
side
inside
boundary

V. Activities:

* A. Using the overhead projector and the Attribute Blocks, introduce the shapes--square, circle, triangle, rectangle. Ask the children to look around the room and find objects that are the same shapes.

* B. The teacher draws a geometric pattern on the board. For example:



Have the children copy this pattern and continue it to the end of the paper. Have the children create more patterns of their own. If the children cannot think of any patterns, the teacher should suggest other patterns and have the children complete them.

* C. Have the children fold a sheet of newsprint twice into four sections. Dictate a shape for the children to draw in the first section. When everyone is finished, have them show what they have drawn. Dictate another shape for the next section and have them show what they have drawn, and so on for the rest of the paper.

* D. Put the Attribute Blocks in a large box or sack. Ask a child to close his eyes, choose one shape from the container, and tell what geometric shape it is without looking.

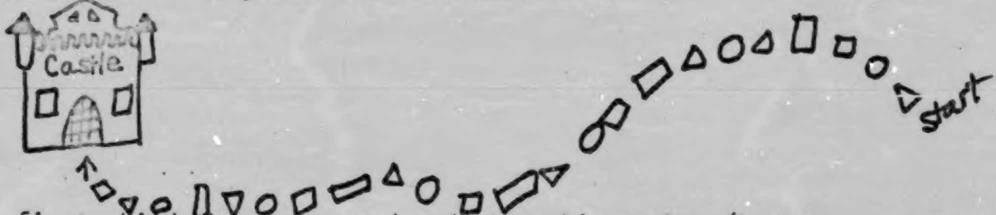
Level: 1 Step: A Concept: Geometry

Activities: (Continued)

E. Tinker toys are a good visual and manipulative device to show geometric figures.

F. Many interesting geometric designs can be made by using pegboards, geoboards, rubber bands, or string. You may be able to borrow pegboards from the kindergarten.

G. "The Magic Kingdom" 1-4 paylers. Using the paper cutter, cut construction paper into 16 - 2 x 2 cards. Draw circles on 4 cards, rectangles on 4, squares on 4, and triangles on 4. Prepare a playing board on tagboard. See illustration.



The first child chooses a card and moves his marker (button, checker, etc.) to the first geometric figure on the playing board that matches the one on his card. The other players do the same and continue playing until one reaches the castle.

H. Appealing to taste may help teach children the shapes. Cookies or crackers may be purchased in the four geometric shapes.

I. Houghton Mifflin Geoboard Cards. #2, 3.

J. Use example on page 1-9.

Level: 1 Step: A Concept: Geometry

Text References:

Book: 1

Houghton Mifflin (1967) pp. 189-194, (29)
Addison-Wesley (1971, 1968) pp. 289-296, (81-86)
Houghton Mifflin (1972) pp. 191-196, (29)

Book: 2

Houghton Mifflin (1967) pp. 221, 222, 225, 228
Houghton Mifflin (1972) pp. 219, 220, 222 (34, 35, 36)
Addison-Wesley (1971, 1968) pp. 293, 294, (82-86)

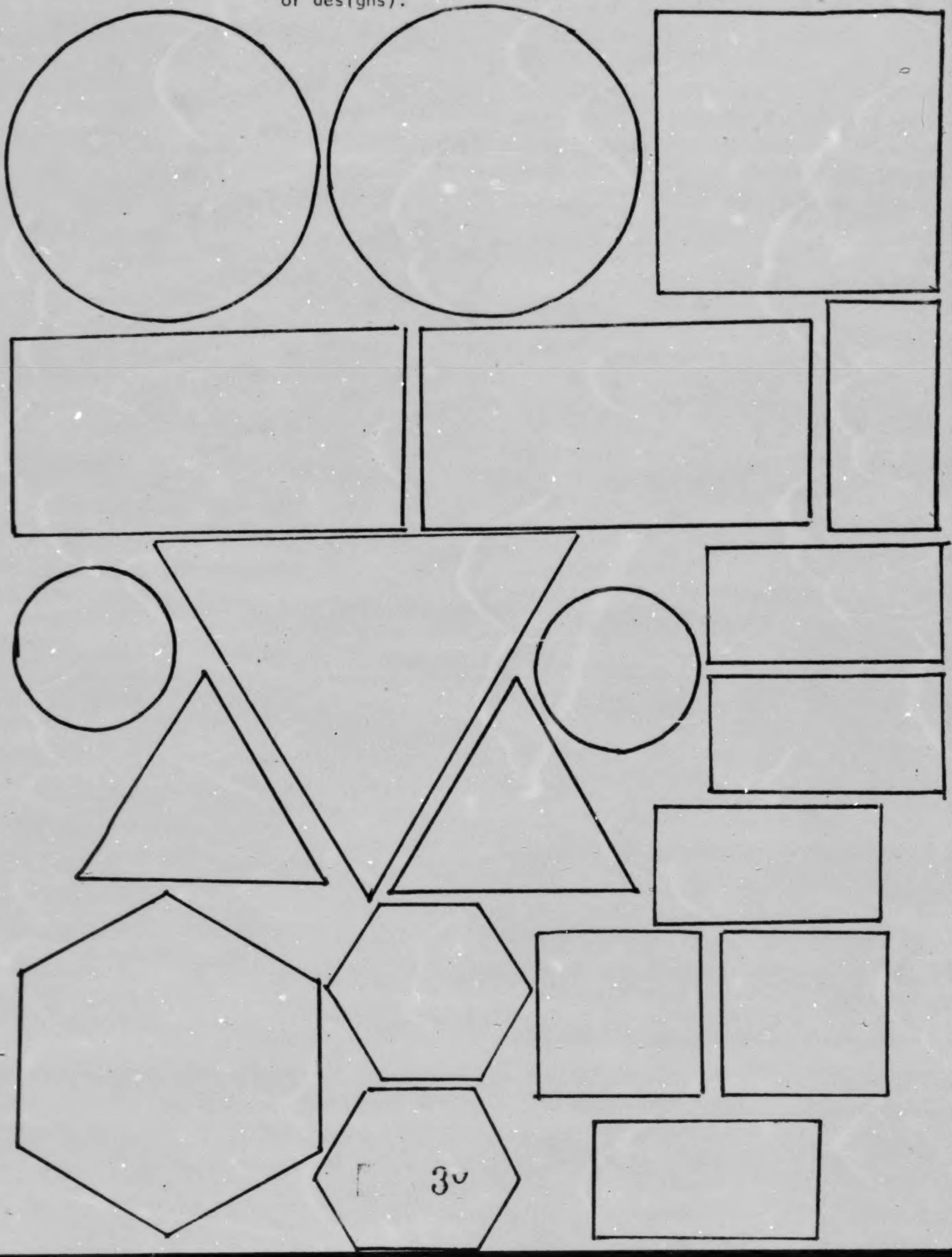
Other References:

Imperial tape #35 (Primary)
* Modern Mathematics Filmstrip #716
In this lesson students are introduced to some properties of simple geometric figures. This lesson is divided into two consecutive days. (This filmstrip includes properties of a cube which does not apply).

* Suggested Introductory Activities.

Level: 1 Step: A Concept: Numeral

Activity J. Reproduce on different colors of construction paper. Have the children cut out the shapes and make figures (people, animals, or designs).



Level: 1 Step: B Concept: Sets

I. Concept:

Sets: Comparing equivalent and non-equivalent sets.

II. Behavioral Objective:

The student given two sets will be able to compare and match the sets.

III. Mathematical Ideas:

A. If the members of set A are matched with the members of set B and no members remain in either set, the members of set A and set B are in a one-to-one correspondence.

B. Equivalent sets have the same number of members.

C. Non-equivalent sets do not have the same number of members.

IV. Vocabulary to Stress:

set
match
compare
more
less
equivalent
non-equivalent

V. Activities:

* A. It is very important to introduce the meaning of equivalent sets. Ask the children if they know their principal's name. When they say his name, write on the board, "Mr. Smith is principal". Explain that Mr. Smith and principal mean the same thing. Therefore, you can write "Mr. Smith = principal". Use other illustrations such as Spot = dog, Dick = boy, Mrs. Jones = secretary, (your name = teacher. Next have two equivalent sets of children come to the front of the room. Have the children count each set. Match the sets of children having them hold pieces of yarn to show they are the same. Ask the children if one set has more or one set has less. Write the statement on the board, for example, 3 = 3. Do this several more times with different numbers of children. Don't forget the empty set

* B. Have the children fold newsprint twice to form four sections and have the child draw a set or cut and paste a set in each section. The opposite sets should be equivalent. Be sure to have the children draw a ring around each set. Then draw lines to match the opposite sets.

C. Give each child a button to keep on his desk. Every time he leaves the room he drops the button into a box at the door, and picks it up when he returns. If any buttons remain in the box, ask the children if each child is matched with a button. (One-to-one correspondence).

D. Distribute Houghton Mifflin Set Cards. (There are nine sets of one through ten in each box.) One child stands in front of the group and shows a card. The other pupils must find the card in their pile that shows the same number as the one held up.

Level: 1 Step: B Concept: Sets

Activities: (Continued)

E. Make eight stick puppets to represent sheep or eight signs that say "Sheep". Assign the puppets to eight children. Have the shepherd place a small rock in a container as each sheep files through the gate and into the pasture. Then as each sheep files back through the gate, the shepherd takes a rock out of the container. If any rock is left, the sheep is lost and the shepherd must find him.

* F. Make four large sections on the chalkboard each section having a different set of objects. Have the children fold newsprint to make four sections and draw four sets equivalent to the ones on the chalkboard.

* G. Each child should fold a 9 x 12 sheet of newsprint in half and draw one set of objects on half the sheet (the sets should have different cardinal numbers). Trade sheets with a neighbor and the neighbor should draw an equivalent set on the other half and draw lines to match the sets.

* H. Have two non-equivalent sets of children come to the front of the room. Match the sets of children having the children hold pieces of yarn showing the sets are not the same. Ask the children which set is greater and which set is less. Repeat many times using sets with different cardinal numbers.

I. "Let's Play Games in Mathematics" Vol. 1, Games 39, 41, 65.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 3-10, 41, 42, 136
Houghton Mifflin (1972) pp. 7-12, 41, 42
Addison-Wesley (1971, 1968) pp. 1-10

Book: 2

Houghton Mifflin (1972) pp. 2, 3, 5, 6

Other References:

Countdown 2, 3
Imperial Tape #16 (Primary)
* Modern Mathematics Filmstrip #700 (described on p. 1-3)

* Suggested Introductory Activities.

Level: 1 Step: B Concept: Numeral

I. Concept:

Numeral: Counting a set to determine the cardinal number. (Cardinal number 7-10)

II. Behavioral Objective:

The student given a set of 7-10 objects will be able to count the objects and write the cardinal number of the set.

III. Mathematical Ideas:

A. A set can be identified with the cardinal numbers 7-10.

B. The cardinal number of a set names the number of objects in a set.

IV. Vocabulary to Stress:

seven nine
eight ten

V. Activities:

* A. Continue activities from cardinal number 0-6 including number book.

* B. Give each child a piece of one inch squared paper. In the upper left hand corner color one square red. In the next row color the first square green and one more square red. In the third row color 2 squares green and one more red. Continue until a total of 10 squares have been colored. This chart will show that each number is one more than the one before.

* C. Songs from pages 1-14, 1-15.

* D. Give each child ten counters. Ask the children to form a set of four on their desks. Then say, "I am thinking of one more than four". Call on a child for the answer and have him show the set of five on the overhead projector or on the board while the other children form the set at their desks.

* E. If needed, have the child write his numerals with his finger in a pan of sand and say the numeral as he writes it.

* F. Write the numerals with Elmer's glue. Have the child trace with his finger and say the numeral as he traces.

* G. Cut numerals out of sandpaper. Have the child trace the numeral with his finger saying the numeral as he traces.

Level: 1 Step: B Concept: Numeral

Activities: (Continued)

H. To give the child practice in counting, tell him to start counting with 3 and count to 10. Then start with 6 and count to 10, etc. This prepares the child for addition. In a problem such as 3 + 2, he can say 3, 4, 5 instead of 1, 2, 3, 4, 5.

* I. The teacher bounces a ball 0-10 times while the children count silently. Call on a child to tell how many times it was bounced. If the answer is correct, he gets to bounce the ball a different number of times.

J. "Let's Play Games in Mathematics" Games 22, 51, 106, 111. (Vol. 1)

* K. Use Arithmablocks for practice in counting.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 32-40, (4, 5)
Houghton Mifflin (1972) pp. 33-40, (4, 5),
Addison-Wesley (1971, 1968) pp. 23-25, (4), 26, (5), 27-31, (6, 7, 8), 32
41, (9), 42, (11), 43, (12), 44-45, (13, 14)
46-47, (15), 48, (42)

Book: 2

Houghton Mifflin (1967) pp. 2-6
Houghton Mifflin (1972) pp. 3-6 (5)
Addison-Wesley (1971, 1968) pp. 3, 5 (1)

Other References:

Imperial tape #11 (Primary) Note: Before using tape #11, the words for numerals must be taught.

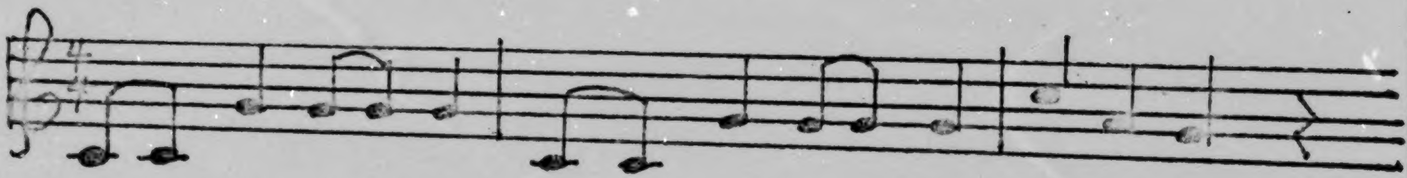
Countdown 4, 6
* Modern Mathematics Filmstrip #701

Children will learn to identify the number of objects in a set which has 5-9 elements. The concepts of "one more", "one less", and "order" will be developed.

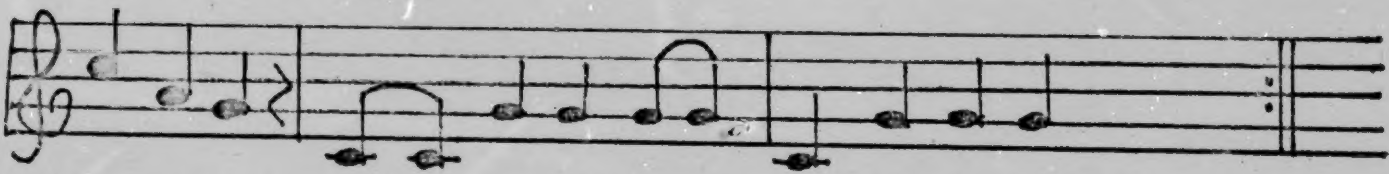
*Suggested Introductory Activities

Level: 1 Step: B Concept: Numeral

Activity C



There were ten in the bed and the lit - tle one said roll o - ver
" " 9 " " " " " " " " " " " "
(Continue to none)
" " none " " " " " " " " " " " "
" " one " " " " " " " " " " " "
" " two " " " " " " " " " " " "
(Continue to ten)
" " ten " " " " " " " " " Good Night (Spoken)



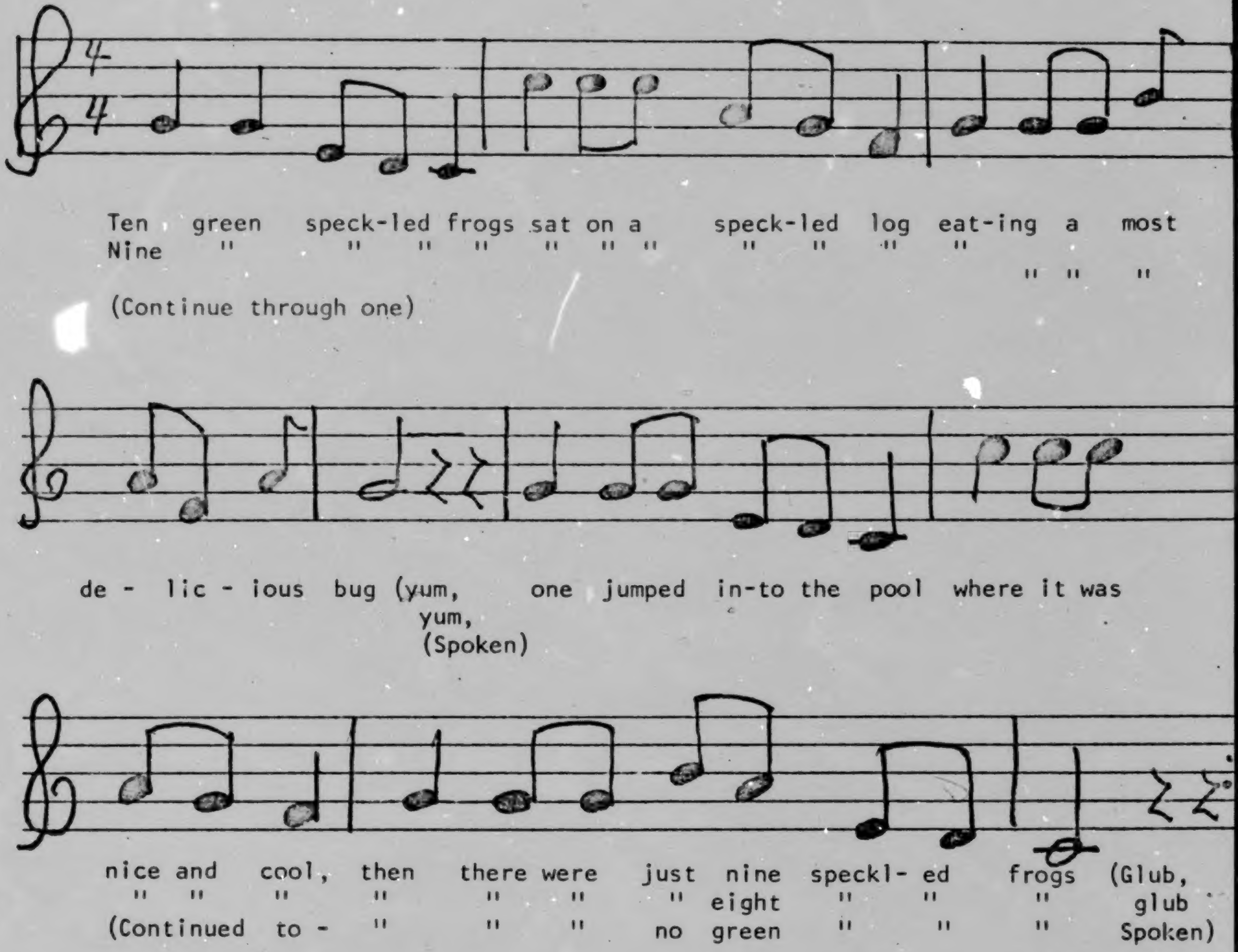
roll o- ver so they all rolled o-ver and one jumped out
" " " " " " " " " " " " "
(Continue to none)
" " " " " " " " " " " " in
" " " " " " " " " " " " in
(Continue to ten)

Use:

Ten Little Indians
This Old Man

Level: 1 Step:B Concept: Numeral

Activity C


Ten green speck-led frogs sat on a speck-led log eat-ing a most
Nine " " " " " " " " " " " " "
de - lic - ious bug (yum, yum, (Spoken) one jumped in-to the pool where it was
nice and cool, then there were just nine speckl- ed frogs (Glub, glub Spoken)
" " " " " " " eight " " "
(Continued to - " " " no green " " "

(Continue through one)

Level: 1 Step: B Concept: Order

I. Concept:

Order (greater and less); Comparing two numbers, 0-10.

II. Behavioral Objective:

The student given a number less than eleven and a sign " < ", " > ", or " = ", will be able to write a number that is one greater than, one less than, or equal to the given number.

III. Mathematical Ideas:

A. The order of cardinal numbers is expressed through the use of " < " and "   ".

B. The equality of cardinal numbers is expressed through the use of " = ".

IV. Vocabulary to Stress:

greater	fewer	equal
less	more than	

V. Activities:

* A. For this activity you will need several pairs of dice or blocks of wood showing numerals 0-10. Have the children roll a pair of dice and tell which set is greater and which set is less. Use the blocks the same way; or dominoes may be used by drawing one from a pile. (This can be done at a station).

* B. Make a "   " for each child. The teacher or a child writes two numerals on the board. The children turn their signs to make a correct sentence. (Could use blocks first and then numerals).

C. Use examples on pages 1-18 through 1-21.

D. Have a row of children at the board, and the rest of the class with pencil and paper. Dictate a pair of numbers and ask the children to make a true statement using the symbols "   ", "   ", and " = ". Be sure to use the inverse statement such as 5   2, and 2   5.

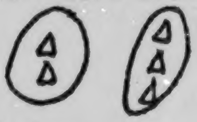
E. "Fishing Game" cut two fish out of tag board for each numeral 0-10. Attach a paper clip to each fish. Make a fishing pole with a magnet tied to a string. Have each student "catch two fish". Make a true statement using the symbols "   ", "   ", and " = ". Be sure to use the inverse statement. (Good at a station).

F. "I'm Thinking of a Number" The teacher says, "I'm thinking of a number greater than eight". Call on a child to give the answer. Repeat, using "less than", "in between", and "the same as". This is a good game when you only have a few minutes.

Level: 1 Step: B Concept: Order

G. "Let's Play Games in Mathematics" Game 45 (Vol. 1)

H. Have each student draw two different sets. Then have them exchange their work with another, who must fill in the story as shown.



$2 < 3$

I. Choose two teams. When you name a number the first two players from each team must name a number that is less (or greater). The one who answers first gets a point for his team.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 43-56
Houghton Mifflin (1972) pp. 43-46, 57-60
Addison-Wesley (1971, 1968) pp. 49-56 (17, 18)

Book: 2

Houghton Mifflin (1967) pp. 7-10
Houghton Mifflin (1972) pp. 7-10 (6)

Other References:

Imperial Tape #1 (Primary) This tape is for enrichment

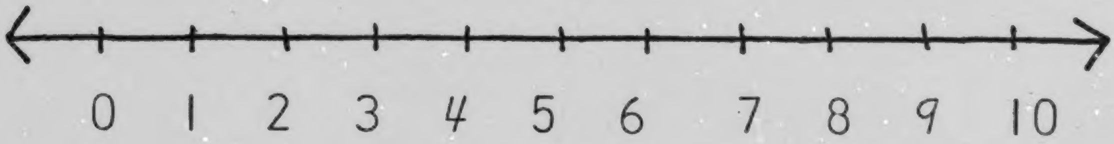
* Modern Mathematics filmstrip #700, #701 (described on p. 1=3 and p. 1-13)

*Suggested Introductory Activities

Level: 1 Step: B Concept: Order

Activity C Name______________________________

Write the sign ("<" ">" "=") in the ring.


0
1
2
3
4
5
6
7
8
9
10

1) 3 ○ 2

2) 2 ○ 3

3) 8 ○ 8

4) 3 ○ 8

5) 2 ○ 4

6) 6 ○ 7

7) 7 ○ 6

8) 6 ○ 6

9) 10 ○ 9

10) 9 ○ 10

11) 4 ○ 5

12) 1 ○ 1

Level: 1 **Step:** B **Concept:** Order

Activity C Name____________________________

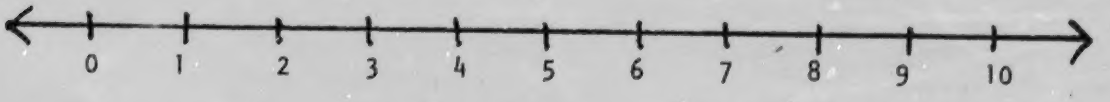
Write the numeral in the box that comes before and after the given numeral.

1)		1	
2)		9	
3)		6	
4)		2	
5)		7	
6)		5	
7)		3	
8)		8	
9)		4	
10)	8		
11)			7
12)	3		
13)			2
14)	6		
15)			4
16)	1		
17)			6
18)	7		

Level: 1 Step: B Concept: Order

Activity C Name________________________________

Write the numeral one greater, one less, or equal to in the box. The sign will tell you which one.



1) 4 > ☐

2) 3 < ☐

3) 1 < ☐

4) 2 > ☐

5) ☐ = 3

6) ☐ > 4

7) 0 < ☐

8) 7 > ☐

9) 2 < ☐

10) 4 = ☐

11) ☐ < 6

12) 9 > ☐

13) ☐ > 8

14) 7 < ☐

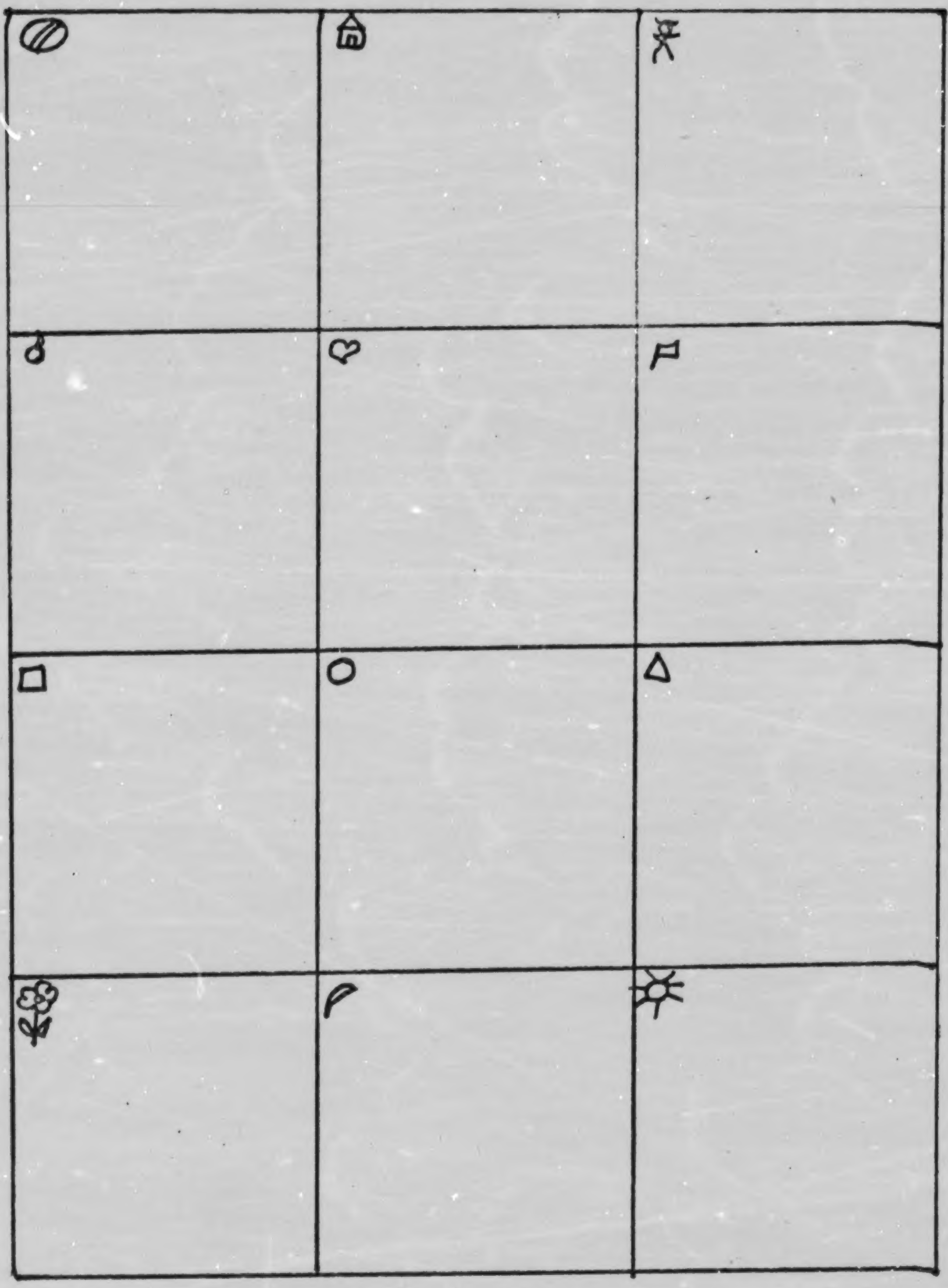
15) 1 > ☐

16) 0 = ☐

Level: 1 Step: B Concept: Order

Activity C

NAME ____________________



Dictate numbers 0-10 in random order. ("Find the ball and write 7. Find the house and write 2 ----" etc.) The children should cut the squares out and paste them in order in a row.

Level: 1 Step: B Concept: Addition

I. Concept:

Addition: Naming sums to six.

II. Behavioral Objective:

The student given two addends will be able to name a sum no greater than six.

III. Mathematical Ideas:

A. Addition involves two numbers (binary operation).

B. There are many names for any number.

C. Addition requires naming a sum.

D. The order of the addends does not affect the sum. (Commutative principle)

IV. Vocabulary to Stress:

sum	add	plus	join
addend	addition	equal	number line

V. Activities:

* A. Give each child a piece of poster paper and a piece of writing paper or newsprint. Have them fold the poster paper in half the short way and draw along the fold with their pencils. Give each child six counters and ask them to separate their counters into two sets on their folded paper--one set on each side of the fold. On their writing paper have them write an equation to go with their sets. Walk around and check their work as they record. Tell the children to leave their counters on the paper and turn it around.

Have the children record the new equation. (With this activity the children learn to use the commutative principle--3 + 2 = 2 + 3) Tell the children to change their sets and write the equation on the paper. Leaving the counters on the paper, turn it around and record the equation. Repeat until you have used all possible combinations of six. Don't forget the empty set. Repeat with other numbers.

* B. Using squared paper, write a problem 1 + 3 =. Children color one square a color, then color three squares another color. Count how many squares are colored, and write the answer.

C. Send a row of children to the board. Children at their desks should have paper and pencil. The teacher dictates a story problem and has the children write the equation.

Level: 1 Step: B Concept: Addition

D. "Everybody Show". Have the children make a set of numerals 0-6. The teacher dictates a problem. When the teacher says, "Everybody Show", the children hold up the answer.

* E. Make a floor number line 0-6 using masking tape on a long-piece of paper. The teacher dictates a number combination and a child steps it off. Repeat.

F. Have the children fold a sheet of paper twice making four vertical sections. At the top of each section write one numberal: 2, 3, 4, 5, 6. Under each numeral have the children write other names for the numeral. Counters might be helpful.

* G. To make counters cut a clothes hanger into a 12 inch rod. String 10 beads on the rod and bend up both ends so the beads cannot come off.

* H. Have the children bring objects from home to be used as quiet counters: cork, foam, and cardboard.

I. Use Houghton Mifflin Perception Cards and Addition Facts Cards.

J. Give each child a set of counters--for example, seven. Have the children separate their counters into two subsets. Have them tell you how many they have in each subset and you record it on the board--for example, 3 + 4, 5 + 2, 6 + 1. Do this with all sets 1-10. When you are working with a set of 1, let the children discover how to sub-divide it (1 + 0). Don't forget the empty set with all the sets.

K. There are many excellent games for sums in the book "Let's Play Games in Mathematics" Vol. 1 (Too many to list).

L. Use examples p. 1-25, 1-26.

Level: 1 Step: B Concept: Addition

Text References:

Book: 1

Houghton Mifflin (1967)	pp.	57-64, 67, 70, 83, 84, 119
Houghton Mifflin (1972)	pp.	47-54, 61, 64, 77, 78, 123 (11)
Addison-Wesley (1971, 1968)	pp.	57-63, (19), 64, (20), 65-67, (21), 68, 93, 97, 98

Book: 2

Houghton Mifflin (1967)	pp.	15, 16, 23, (1,2)
Houghton Mifflin (1972)	pp.	15, 16

Other References:

Countdown 16, 18

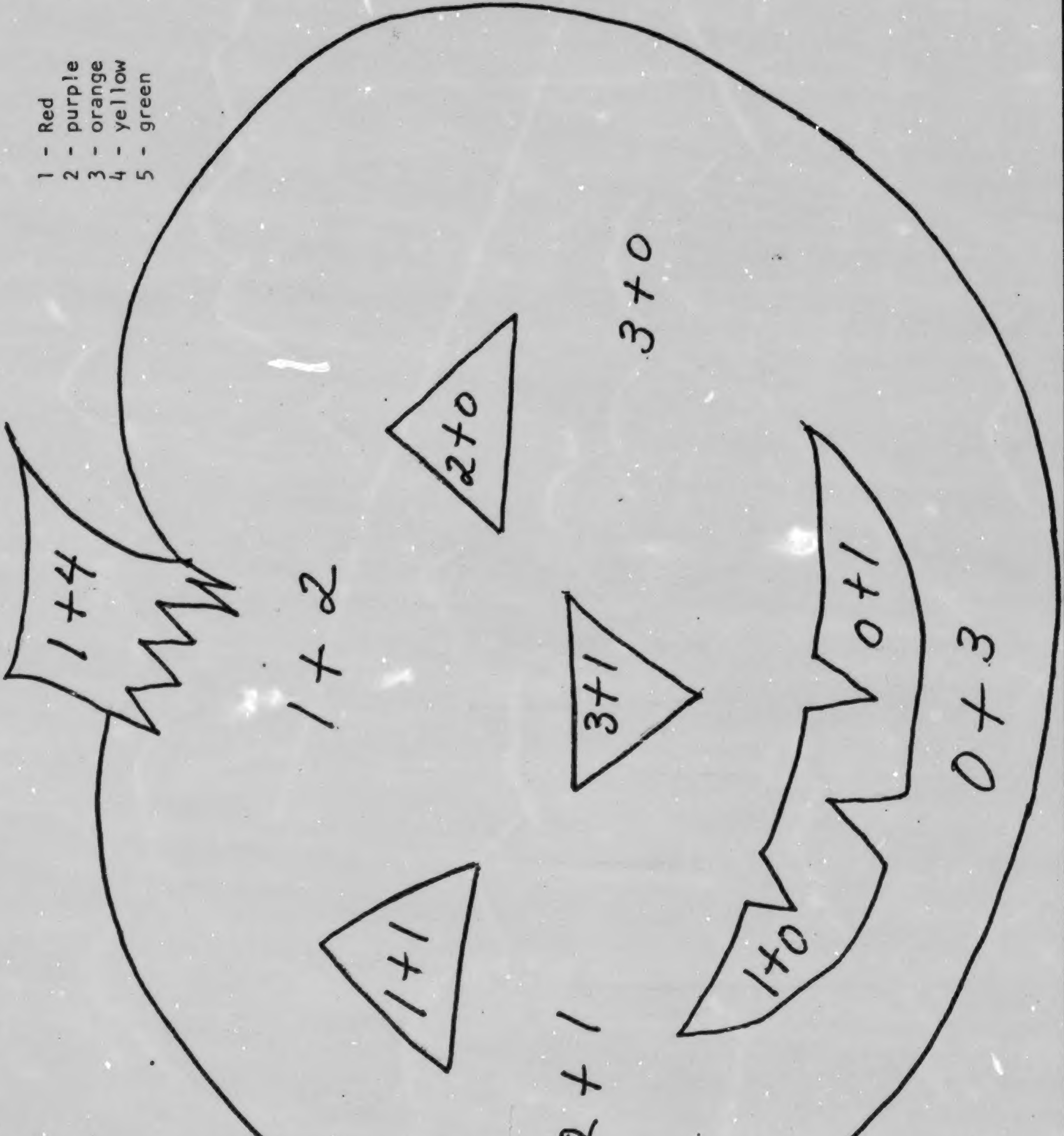
* Modern Mathematics Filmstrip #702
This filmstrip reviews numbers 0-9. The meaning of "plus" and the symbol + are taught. The children are introduced to number sentences and the number line is used beiefly toward the end.

* Suggested Introductory Activities.

Level: 1 Step: B Concept: Addition

Activity L. NAME______________________________

1 - Red
2 - purple
3 - orange
4 - yellow
5 - green


1+4
1+2
2+0
3+0
3+1
1+1
2+1
1+0
0+1
0+3

Level: 1 Step: B Concept: Addition

Activity L. NAME ______________________

X the incorrect equation (or color it)

1)	$2 + 1 = 3$	9)	$2 + 4 = 5$
2)	$5 + 0 = 1$	10)	$1 + 1 = 2$
3)	$6 + 0 = 6$	11)	$3 + 1 = 2$
4)	$2 + 2 = 3$	12)	$0 + 1 = 1$
5)	$4 + 2 = 6$	13)	$3 + 2 = 6$
6)	$3 + 3 = 5$	14)	$4 + 0 = 4$
7)	$4 + 1 = 5$	15)	$5 + 1 = 5$
8)	$2 + 3 = 5$	16)	$1 + 2 = 3$

Level: 1　　Step: B　　Concept: Subtraction

I. Concept:

Subtraction: Finding the missing addends to six.

II. Behavioral Objective:

The student given a sum and one addend both less than seven will be able to name the missing addend.

III. Mathematical Ideas:

A. Finding the missing addend is an introduction to subtraction.

B. Subtraction is the inverse of addition.

C. Subtraction is renaming a sum and one addend as a missing addend.

IV. Vocabulary to Stress:

addend	equals	take away
missing addend	minus	part of a set
subtract		

V. Activities:

* A. Place 1 to 6 counters on the overhead projector or the flannel board. Have the children place the same number of counters on their desks. The children follow the teacher in removing part of the counters. Either the teacher or a student writes the equation on the board, while the rest of the group write at their desks.

B. The teacher or a child can dictate word problems and the children write the equations on the board and/or at their desks.

* C. Floor number line (See Activity E. p. 1-23)

D. Use flannel board to show the "separating" of sets. Have children state or write the equation.

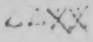
* E. Game. "How Do You Write It?" Provide a paper bag and 1-6 counters. Show that the bag is empty. Drop counters in: (i.e.--3 buttons and then 2 more). Have a child write the equation on the board. Drop 5 counters in the bag. Have the child reach in and get 2 (without looking). Have the child write the equation on the board. Check in the bag to see if his equation is correct. Use this to teach the inverse operation, using different combinations.

F. There are many excellent games in "Let's Play Games in Mathematics", Vol 1. (Too many to list).

G. "Cross Over the Bridge." Divide the class into two teams. Tell them to imagine a bridge across the front of the room. A flash card with an addition or subtraction combination is shown to the first member of each team. The first one to give a correct answer goes to the end of his team's line. The loser crosses over the bridge and joins the other team at the end of the line. The team with the most members wins the game.

* H. Arithmablocks are excellent tools for teaching missing addends.

* I. A good auditory and visual approach to subtraction is through the use of balloons. If you are teaching 3 - 2 = 1, attach three balloons to a convenient place. Pop two of the balloons. Have the children tell you what numerals to write in the equation. Repeat several times.

* J. Put problems on the board, such as 4 - 2, 6 - 4, etc. Give the children a sheet of newsprint and some colored paper. Ask the children to write the problems, and show the problem by cutting out shapes from the colored paper and pasting them on the newsprint. The first problem might look like this: 4 - 2  = 2.

K. Give each child a set of counters, for example, five. Have him separate it into subsets of two and three. Have him take away the subset of three. Ask the children to suggest ways to record this. If no one can tell you how to write it, the teacher will write the correct equation on the board (5 - 3 = 2). Erase the equation and write 5 - 3 = and have a child tell you what goes in the box. Erase that and write 5 - = 2, and have a child tell you what goes in the box. Erase and write 2 + 3 = and have someone tell what goes in the box. Erase and write 3 + 2 = and have a child tell the answer. Use in the same way 2 + = 5 and 3 + = 5. Have the children use their counters to discover the answers. Use this method with sets 1-10.

L. Use Houghton Mifflin Equation Cards and Subtraction Cards.

Level: 1 Step: B Concept: Subtraction

Text References:

Book: 1

Houghton Mifflin (1967) pp. 65, 66, 68, 69 (6, 7), 71-78, (8), 79-82 (9), 86, 87, 91--95, (10), 96, (11), 97, 98, (12), (14), 104, (15), 105-108, (16, 17), 120, (23), 151-164, 195, (24), 198, (25).

Houghton Mifflin (1972) pp. 55, 56,(7) 62, 63, 65-72, (8), 73, (9), 74-76, (10), 79-86, (12), 91, 92, (14), 109-112, 135-148, 202 (18,23,24).

Addison-Wesley (1971, 1968) pp. 69-70, (22), 71-77, (23), 78-79, (24), 80-81, (25), 82-85, (26), 86-88, (27), 89-92, (28), 95-96, (29), 99-108, (31).

Book: 2

Houghton Mifflin (1967) pp. 22, 24-26 (3)
Houghton Mifflin (1972) pp. 17-26, 30, 53-54 (3).

Other References:

Countdown #26

* Modern Mathematics Filmstrip #704 Subtraction: The word "minus" and the sign " - " are introduced. The children are taught the relationship between addition and subtraction. Word problems are used also.

* Suggested Introductory Activities

Level: 1 Step: C Concept: Sets

I. Concept:

Sets: Separating a set into sub-sets.

II. Behavioral Objective:

The student given a set will be able to recognize a subset of that set.

III. Mathematical Ideas:

Every set except the empty set has at least two subsets.

IV. Vocabulary to Stress:

set	members	property
subset	empty	

V. Activities:

* A. Use the Attribute Blocks to teach that members of a set must have a common property. Put the Attribute Blocks (except the hexagon) into a box so the children cannot see. Ask the children what they think you have in the box. If they guess "blocks", ask them what kind of blocks. Continue questioning until someone guesses either color or shape. After you show them one block, insist they be more specific as to the color and shape. Continue activity until all blocks are described. Ask the children what properties the blocks have (color, shape, size, thickness.)

* B. Give each child three or four different Attribute Blocks. (borrow a set from another teacher.) Have the children classify the blocks according to property. "All the children with red blocks bring them to the front of the room." There are many directions you could give. A very complicated one might be, "All the children with a small, blue, thin rectangle come to the front of the room." Continue activity until all come to the front of the room." Continue activity until all children have participated. Many variations are possible depending on the directions you give.

* C. Separate the children into subsets of four. Give each subset a box of Attribute Blocks. Tell the children to separate their blocks into subsets according to property. When you see a group of children separating the blocks using a certain property (for example, color), suggest that everyone use that property. Continue activity until all the properties have been used.

D. Place the Attribute Blocks at a station somewhere in your room for the children to work on in their free time.

Level: 1 Step: C Concept: Sets

Activities: (continued)

* E. Take a walk around the block with your children and have each child collect 5 leaves. Bring them back to school and have each child separate his leaves into subsets according to the properties such as jagged edges, smooth edges, color, size (large and small), shape. With all activities having to do with property, discuss all possible properties and let the child choose one to use.

F. Walk to a wooded or park area and collect insects in a plastic bag. Bring them back to school and separate them into subsets (in jars) according to their properties.

G. Distribute buttons to the children. Have them separate the buttons into subsets according to their properties--size, shape, color, number of holes, etc.

* H. Using all the children as a set, separate into subsets of boys and girls. Separate the boys into right handed and left handed and separate the girls the same way. Separate each subset into those that have red and those do not have on red. (You may have empty sets.)

I. Give each child a set of flannel board cut outs. Have the child separate according to property and then ask which property he used.

J. Use examples on pages 1-32 and 1-33.

Text References: None

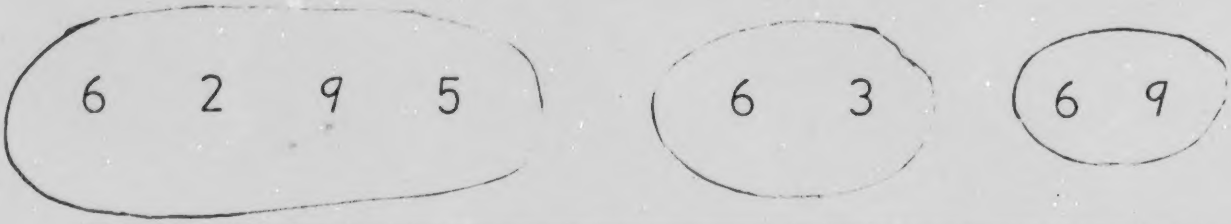
* Suggested Introductory Activities.

Level: 1 Step: C Concept: Sets

Activity J NAME________________________

Put an X on the set that belongs to the first set.

1)



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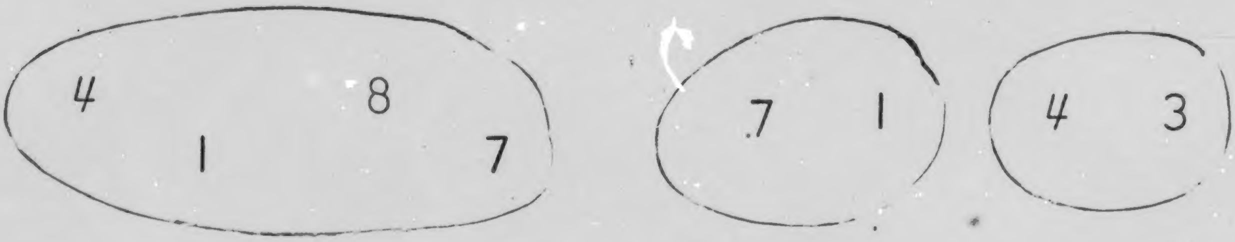

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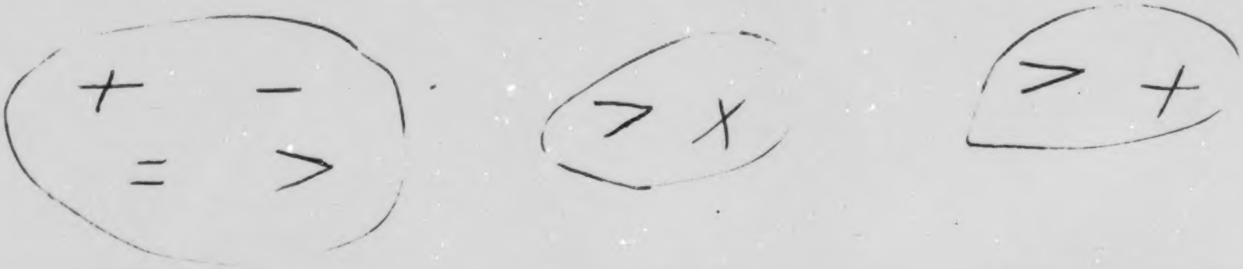

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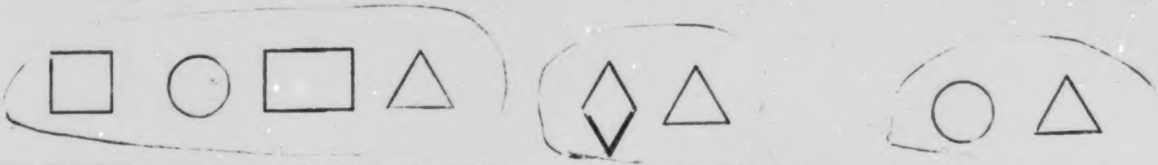

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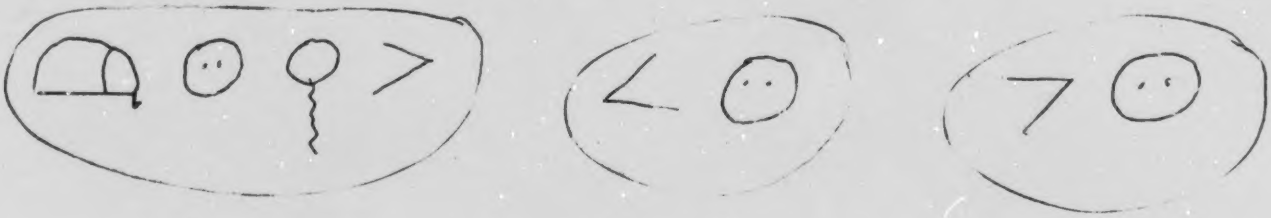
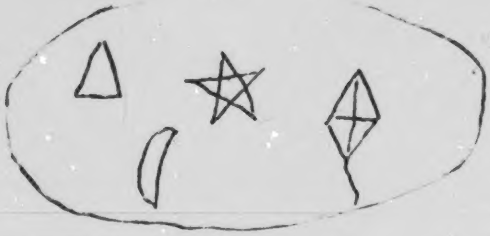


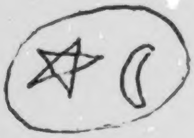
Level: 1 Step: C Concept: Sets

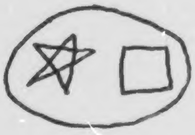
Activity J NAME________________________________

Put an X on the set that belongs to the first set.

1)







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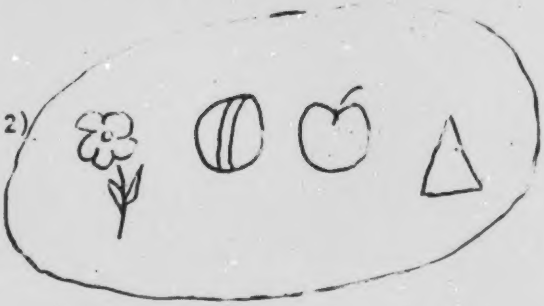

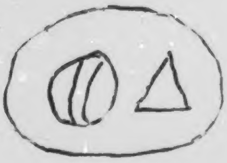

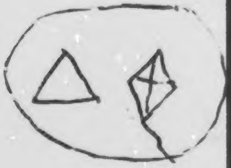

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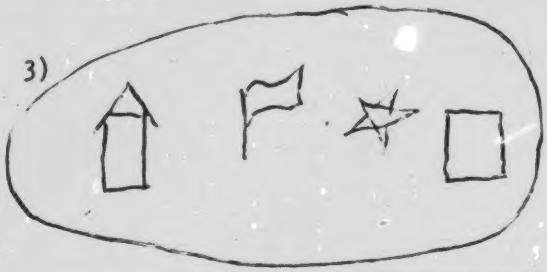

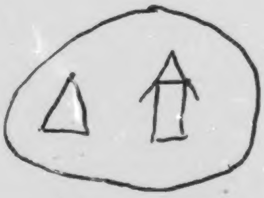

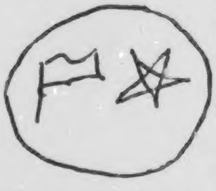

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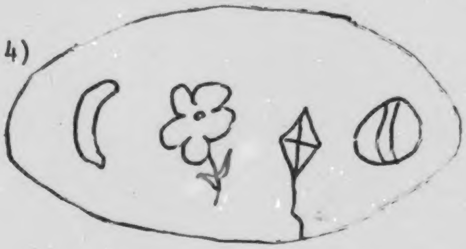

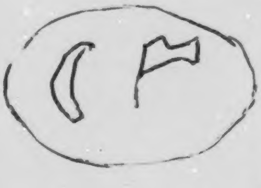

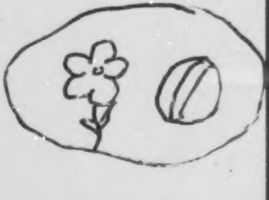

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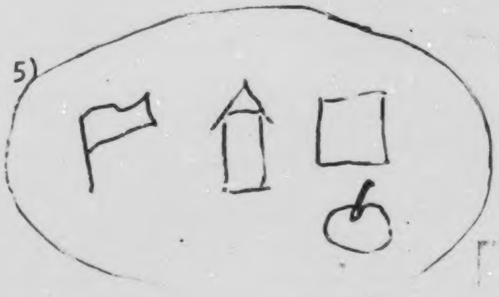
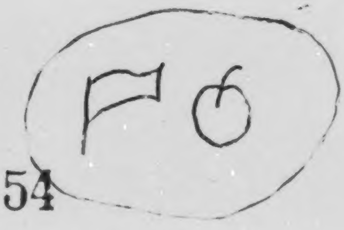
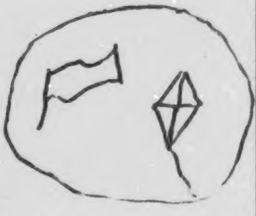






Level: 1 Step: C Concept: Order

I. Concept:

Order: Using ordinal numbers to ten.

II. Behavioral Objective:

The student given a row of objects and an ordinal number will be able to locate the object.

III. Mathematical Ideas:

A. Ordinal numbers are related to positions in an order.

B. An ordinal number tells which one in a series is being considered.

IV. Vocabulary to Stress:

order
first
second
third
fourth
fifth
sixth
seventh
eighth
ninth
tenth

V. Activities:

* A. Assign an ordinal number to each row of children. Use this ordinal number when calling the children to get in line to get drinks, to go to the board, etc. Also, assign each child an ordinal number.

* B. Establish a reference point for each child on his desk. Using a Magic Marker make a small X or dot on the left edge in the middle.

* C. Have the children arrange their counters in a row using their reference point. Put the counters in order such as: red, blue, white, yellow, etc., until they have ten. Give directions for finding the first or the fourth, etc. Call on a child to tell the color.

* D. Put ten pictures or objects in a row. Call on a child to answer a question such as, "Which one is fifth?", etc. Next have ten children stand in a row and continue the activity.

E. Each child has been assigned an ordinal number. Use this number to call on a child for passing books, collecting papers and answering questions. For example, "The third child in the fourth row may collect the papers."

F. Use ordinal numbers in giving directions for the children to go to the windows, shelves, chalkboards, etc.

G. Be sure to use ordinal numbers with the calendar.

H. Let's Play Games in Mathematics Vol. 1 #91, #113

Level: 1 Step: C Concept: Order

Activities: (continued)

I. Each day discuss your place in the lunch line. "Are we the first room to go to lunch or the third?

J. Use examples on pages 1-36 and 1-37.

* K. Have each child trace around his hand on a piece of paper. Establish that the little finger is the first finger. Give directions such as: "Draw a ring on the second finger, color the fingernails of the first and third fingers red, etc.

Text References:

Book: 1

Houghton Mifflin (1972) pp. 307-308

Book: 2

Houghton Mifflin (1967) pp. 13-14
Houghton Mifflin (1972) pp. 13-14

Other References:

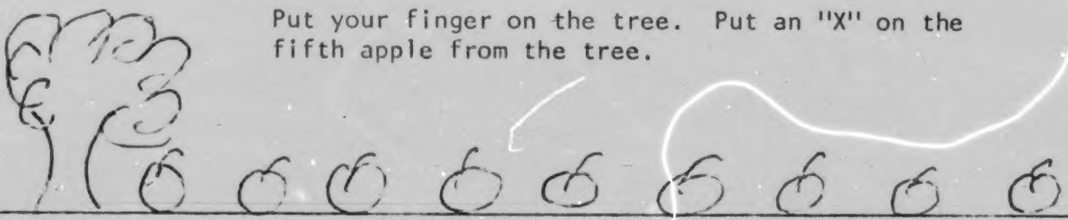
Imperial Tape #39 (Primary)

*Suggested Introductory Activities

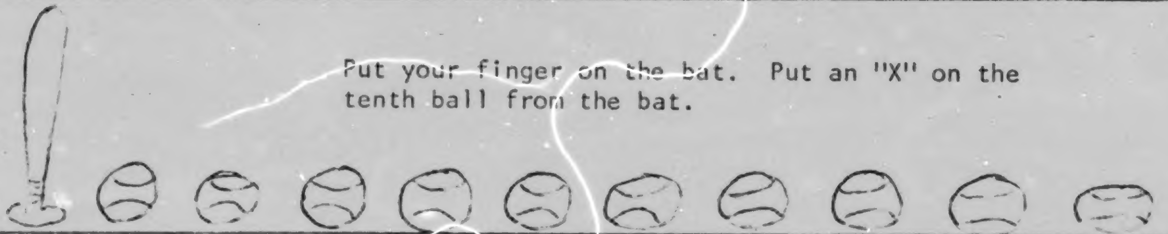
Level: 1 Step: C Concept: Order

Activity J NAME ______________________

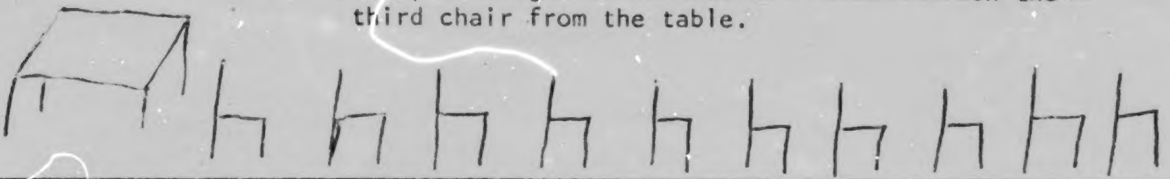
1) Put your finger on the tree. Put an "X" on the fifth apple from the tree.



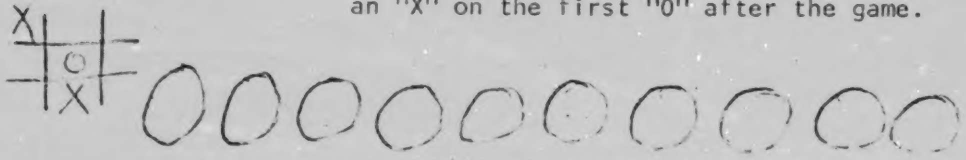
2) Put your finger on the bat. Put an "X" on the tenth ball from the bat.



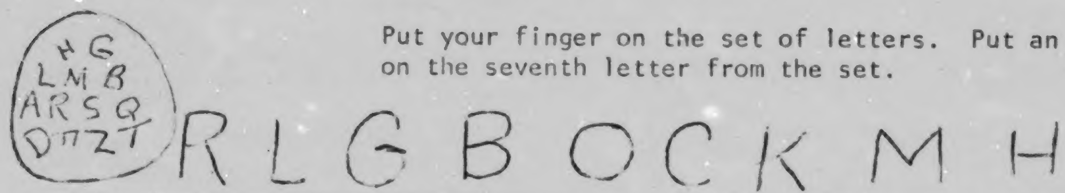
3) Put your finger on the table. Put an "X" on the third chair from the table.



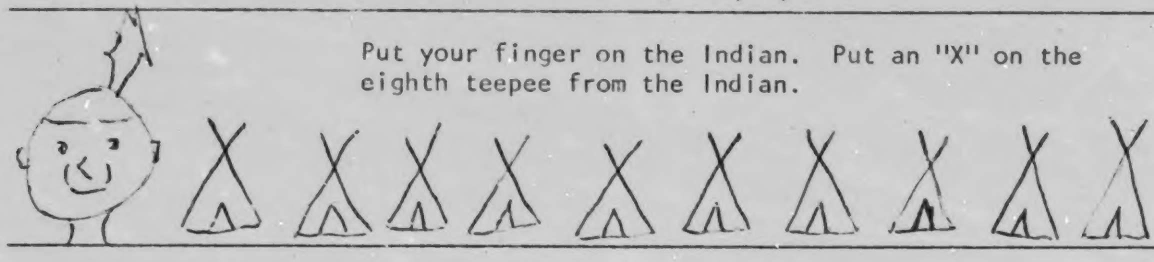
4) Put your finger on the Tic - Tac - Toe game. Put an "X" on the first "O" after the game.



5) Put your finger on the set of letters. Put an "X" on the seventh letter from the set.



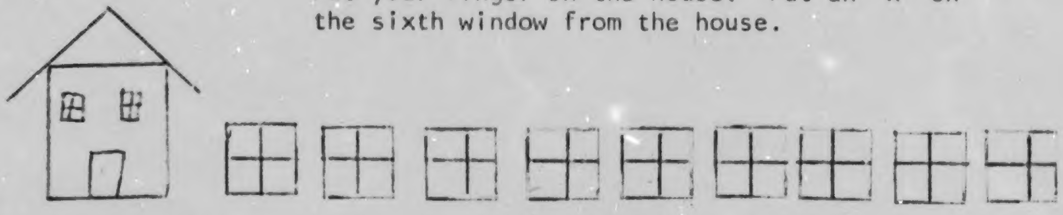
6) Put your finger on the Indian. Put an "X" on the eighth teepee from the Indian.



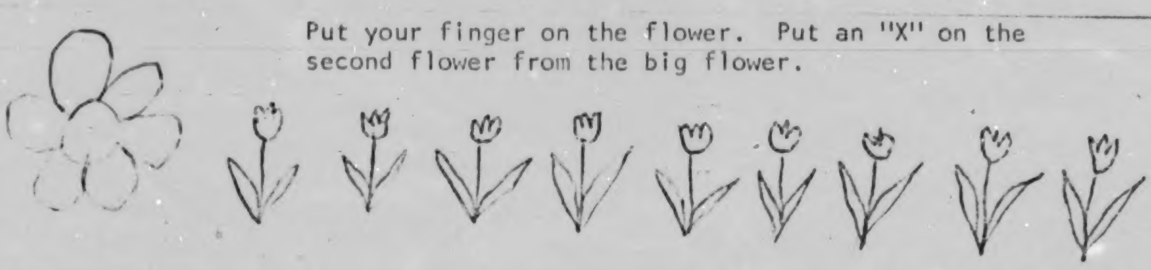
Level: 1 Step: C Concept: Order

Activity J NAME ____________________

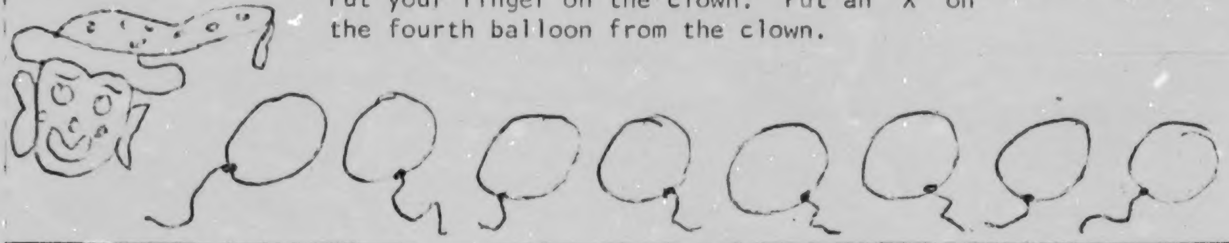
1) Put your finger on the house. Put an "X" on the sixth window from the house.



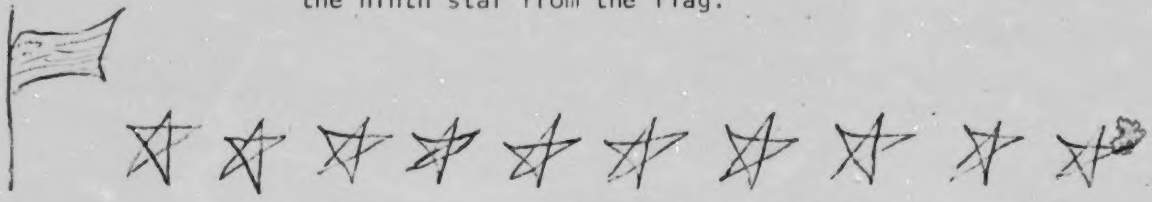
2) Put your finger on the flower. Put an "X" on the second flower from the big flower.



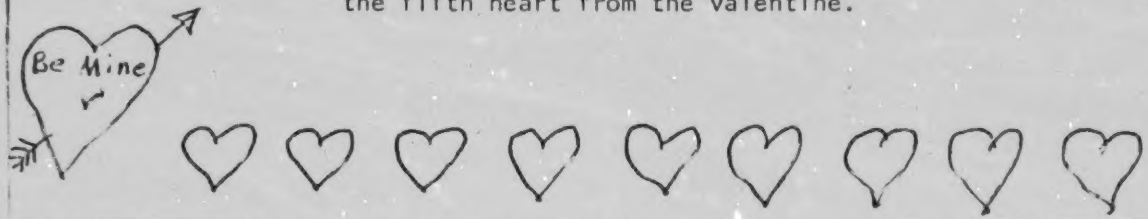
3) Put your finger on the clown. Put an "X" on the fourth balloon from the clown.



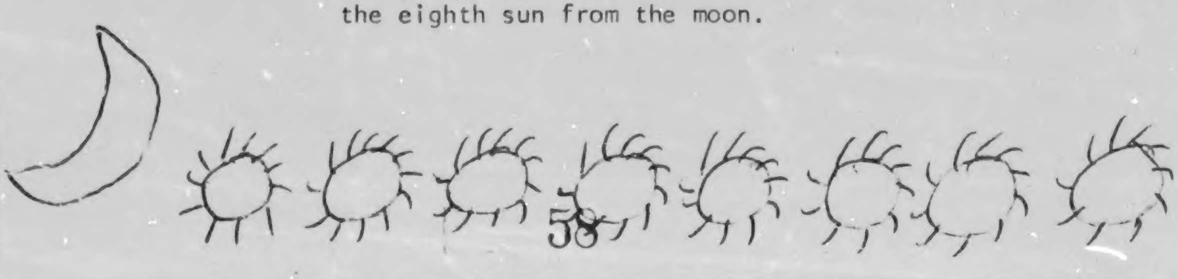
4) Put your finger on the flag. Put an "X" on the ninth star from the flag.



5) Put your finger on the Valentine. Put an "X" on the fifth heart from the valentine.



6) Put your finger on the moon. Put an "X" on the eighth sun from the moon.



Level: 1 Step: C Concept: Measurement

I. Concept:

Measurement: Introducing penny, nickel, and dime.

II. Behavioral Objective:

The student given a penny, nickel, and a dime will be able to tell their names and give their values with 100% accuracy.

III. Mathematical Ideas:

A. One-to-many correspondence.

B. A nickel has the same value as 5 pennies.

C. A dime has the same value as 10 pennies.

IV. Vocabulary to Stress:

penny
nickel
dime
cents
value
matching

V. Activities:

* A. Show the children a real penny, nickel, and dime and explain the value of each. Have the children sitting in a circle on the floor. Place the money on black paper so that it can be seen easily. The opaque projector may be used.

* B. Pass out to each child 10 pennies, 2 nickels, and 1 dime. Ask the children to hold up each coin in turn as you name it. Have the children show the value of the penny, nickel, and dime using the coins on their desks.

C. Construct a play store with blocks or large carton. Furnish the store with empty boxes and bottles from home. Children take turns playing storekeeper, clerk, or customer. A play cash register will add excitement.

D. If the children are interested they can have fun counting money. Use dimes and count by tens. Use nickels for counting by fives, and pennies for counting by ones. Then try mixing the coins together to count. This activity should be only for the children who are ready for it.

E. "Let's Play Games in Mathematics" Vol. #1., Games #85, #89, #97.

Text References: None

Other References:

Imperial Tapes #37 (Primary) - enrichment

* Suggested Introductory Activities

Level: 1

ANSWERS TO WORKSHEETS

1-4

1) Blue
2) Green
3) Red
4) Orange
5) Blue
6) Green
7) Red
8) Orange

1-18

1) >
2) <
3) =
4) <
5) <
6) <
7) >
8) =
9) >
10) <
11) <
12) =

1-19

1. 0, , 2
2. 8, , 10
3. 5, ,7
4. 1, ,3
5. 6, ,8
6. 4, , 6
7. 2, , 4
8. 7, , 9
9. 3, , 5
10. , 9, 10
11. 5, 6,
12. , 4, 5
13. 0, 1,
14. , 7, 8
15. 2, 3
16. , 2, 3
17. 4, 5,
18. , 8, 9

1-20

1. 3
2. 4
3. 2
4. 1
5. 3
6. 5
7. 1
8. 6
9. 3
10. 4
11. 5
12. 8
13. 9
14. 8
15. 0
16. 0

1-25

mouth - red
eyes - purple
face - orange
nose - yellow
stem - green

1-26

1.
2. X
3.
4. X
5.
6. X
7.
8.
9. X
10.
11. X
12.
13. X
14.
15. X
16.

1-32

1. 0 [✓ 0]
2. [✓ 0] 0
3. 0 [✓ 0]
4. 0 [✓ 0]
5. 0 [✓ 0]

1-33

1. [✓ 0] 0
2. [✓ 0] 0
3. 0 [✓ 0]
4. 0 [✓ 0]
5. [✓ 0] 0

TABLE OF CONTENTS

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2. Order: Comparing numbers 10-99 2-37
3. Addition: Three one-digit addends. 2-40
4. Measurement: Linear measure: non-standard units . . 2-41

Answers to Worksheets 2-44

Level: 2 Step: A Concept: Numeral

I. Concept:

Numeral: Developing the principle of place value using a two-digit number.

II. Behavioral Objective:

The student given a two digit number will be able to write the numeral and tell how many tens and how many ones.

III. Mathematical Ideas:

A. Our number system uses the base ten.

B. Each numeral has a place value.

IV. Vocabulary to Stress:

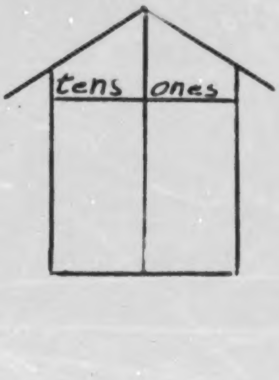
- abacus
- bundles of ten
- ones
- tens
- sets of ten
- order
- eleven
- twelve
- thirteen
- fourteen
- fifteen
- sixteen
- seventeen
- eighteen
- nineteen
- twenty
- place value
- thirty
- forty
- fifty
- sixty
- seventy
- eighty
- ninety

V. Activities:

* A. To introduce the idea of ten, throw ten toothpicks or soda straws into the air and have a child count them as he picks them up. Put a rubber band around them. Repeat several times, having different children count as they pick up the toothpicks. Then throw a bunch of ten (with the rubber band around them) into the air to show how much easier it is to pick up the toothpicks and count them when they are grouped together. (Place value is simply a fast way of counting.)

* B. Give each child a handful of toothpicks and nine rubber bands. Have the children put a rubber band around sets of 10. Continue working until all have 9 tens and 9 ones.

* C. In another lesson have all the bundles of tens and ones at the top of their desks. Have the children form a group of 2 tens and 3 tens. Make a house on the board or transparency like this:



Ask the children how many tens and write the number in the house. Ask how many ones and write the numeral in the house. Write both numerals on the board and say, "When you put them together; what numeral do you have?" Repeat this with other numbers.

Level: 2 Step: A Concept: Numeral

V. Activities: (Continued)

* D. Have paper, pencil, and the bundles of tens and ones on their desks. Tell the children to fold the paper once and write "Tens" on the left and "Ones" on the right. Ask a child to be leader and he tells the other children to show him (for example) three tens and two ones. The leader writes the tens and ones on the board while the children write them on their papers. After the leader writes the numeral on the board (32), he chooses someone to read it and be the new leader.

* E. The counting frame and abacus can be used for similar activities.

F. For this game you may use two teams or send the children to the board by rows. Dictate a statement such as three tens and four ones, and the children write the numeral (34). After all the children have had a turn, change the game by dictating the numeral and having the children write the tens and ones.

G. Have the children get out their bundles of toothpicks but no ones. The teacher using the counting frame should show four groups of 10 and tell the children to show the same number of tens. Ask the children how many groups of ten there are and write the number on the board. Then ask how many ones (emphasize the idea of an empty set) and write the number on the board. Ask a child to read the numeral. Continue activity using 10, 20, 30, 40, etc. to 90.

H. "I'm Thinking of a Number". The teacher says, "I'm thinking of a number that has one ten and eight ones". Call on a child to give the answer. This is a good game when you only have a few minutes.

I. Buy or make a Bingo game. When you are playing the game, you might say, "4 tens and 3 ones or 43".

J. "Let's Play Games in Mathematics", Vol. 1, Games #28, 32, 48, 69, 93, 95.

Level: 2 Step: A Concept: Numeral

Text References:

Book: 1

Houghton Mifflin (1967) pp. 121-126, (20), 127-129, 137-144, (22)
247, 253.
Houghton Mifflin (1972) pp. 93-100, 125-131, 221-222, 225-227
(15,16,21)
Addison-Wesley (1971, 1968) pp. 153, 154-158, (43), 159-160,
(44, 45), 161-164, (46), 165-168,
(47), 169-170, 173-174, 239-240.

Book: 2

Houghton Mifflin (1967) pp. 97, 98
Houghton Mifflin (1972) pp. 93-98
Addison-Wesley (1971, 1968) pp. 7-9, (2), 10-11, (3).

Other References:

Countdown 9, 10, 11, 12, 13.

Modern Mathematics Filmstrip #712

> Use phase one only. Numerals 0-99 are developed by considering the grouping of marbles by tens.

* Suggested Introductory Activities.

Level: 2 Step: A Concept: Order

I. Concept:

Order: Ordering the numbers 10-99.

II. Behavioral Objective:

The student given a number line or a chart with a two-digit numeral will be able to fill in the rest of the numerals in order.

III. Mathematical Ideas:

A. In our system of numeration there are ten digits: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

B. These digits may be used to represent any number.

C. Counting is a one-by-one procedure based on the fact that each number is one greater than the number that precedes it.

IV. Vocabulary to Stress:

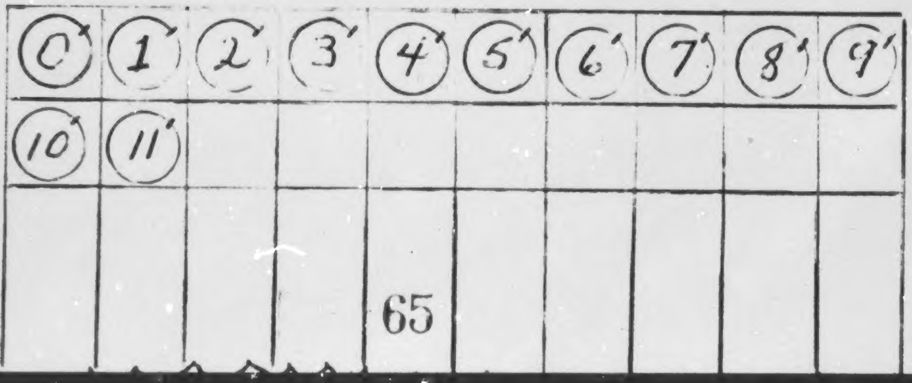
number line order counting

V. Activities:

A. While standing in line waiting for the bell, have the children count in unison by ones, twos, fives and tens. Whispering in unison can be fun for the children and the teacher!.

B. When taking the lunch count, have the children who are buying their lunch stand up and count; the first child saying, "one", the second child saying, "two", etc.

C. Make a Hundreds Board out of soft wood or fiberboard about three feet square. You will also need 100 cup hooks or nails and 100 round identification tags. Write the numerals 0-99 on the tags. Put a colored dot on the back of each tag. Each row of dots should be a different color. This could be made out of tagboard and paper clips. Make a slit at the top of each section and insert a paper clip. Each number card can be slipped under the paper clip.



V. Activities: (Continued)

D. Using squared paper have the children write the numerals 0-99 in the squares. For more practice make a ditto with 100 squares and put numerals in some of the squares. Have the children fill in the rest. See example on 2-7.

E. Pass out alphabet or number cards to the children so they can get themselves in order to go to lunch or out to recess.

F. Make a ditto of a calendar showing the month and the days of the week. Put in the numerals for the first and last days and have the children finish the page. See example on 2-8.

G. Give each child a 12 x 18 sheet of newsprint. Tell the children to put a star (*) somewhere on the paper. Then tell them to put their first numeral (25 or 32) next to the star and continue with the numerals as far as you want them to go scattering them all over the paper. Ask them to write their name at the bottom of the paper. Have them trade papers with their neighbor. The neighbor should find the star and follow the numerals in order.

H. Use the identification tags from the hundreds board. Assuming you have 25 children in your room, take 0-24 from the hundreds board and pass out at random to the children. Have the children arrange themselves in order. The child with the lowest number should check by counting. Each child returns his tag to the board. Repeat this activity using tags 25-49 and continue until all tags are used.

I. Repeat "Cross Over the Bridge" from page 1-28, Activity G. Change the game by telling a number (10-99) to the first member of each team. The first one to tell you the number that comes before or after the number you said goes to the end of his team. The other person must cross over the bridge and go to the end of the team that won. For variety give two numbers and ask what number comes between.

J. Say "If you know 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 you can write any number in the world". Ask the children for any number they can think of and write it on the board. Repeat until the children are convinced.

K. "Magic Number". Put up to 100 paper clips, beans, buttons, counters or pipe cleaners in a box. Tell the children to count the paper clips in their spare time and to write the number and their name on a piece of paper and put the paper in another box. At the end of the day check to see who counted the "Magic Number".

L. "Let's Play Games in Mathematics", #47, 81, 102.

Level: 2 Step: A Concept: Order

Text References:

Book: 1

Houghton Mifflin (1967) pp. 131-134, 145-147, 150, 213, 245-246, 254-255(21).
Houghton Mifflin (1972) pp. 102-107, (21), 132, 133, 228-232 (17,22).
Addison-Wesley (1971, 1968) pp. 171, (48), 172, 175-176, (49), 177-178, 181-184.

Book: 2

Houghton Mifflin (1967) pp. 99, 100
Addison-Wesley (1971, 1968) pp. 15-16, 21-22.

Other References:

Countdown 14.

Imperial Tape #10 (Primary)

Modern Mathematics Filmstrip #705.

In this lesson students learn to write numerals for numbers between 10-100. The first part of the lesson is concerned with identifying sets of 10. "More than" and "less than" are introduced to test the students understanding of place value.

Level: 2 **Step:** A **Concept:** Order
Activity D

NAME ______________________

Fill in the missing numerals.

0									
	11								
20									29
			33						
					45				
							57		
		62							
				74					
80									89
				68		96			

Level: 2 Step: A Concept: Order

Activity F NAME ______________________

Name of month ______________

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Level: 2 Step: A Concept: Addition

I. Concept:

Addition: Naming sums 7-10.

II. Behavioral Objective:

The student given two addends will be able to name a sum no greater than ten.

III. Mathematical Ideas:

A. Addition involves two numbers (binary operation).

B. There are many names for any number.

C. Addition requires naming a sum.

D. The order of the addends does not affect the sum.

IV. Vocabulary to Stress:

sum
addend
add
addition
plus
equals
join
number line
number family

V. Activities:

A. Refer to Activities from p. 1-22. Adapt for sums 7-10.

B. Divide the class into teams. Give the first member in each team a combination. The first team to get the correct sum earns a point.

C. Use example on page 2-11 through 2-17.

D. Draw two long double columns on the chalkboard. Write "Add 1" at the top. Write the digits 0-6 in order in the first column, and (still moving down the column) repeat them at random. Leave the second column blank. Divide the class into teams. The first member of each team should write the answer in the second column, give the chalk to the next in line, and go to the end of the line. When the relay is finished, give three points to the team that finishes first and one point for each correct answer. To vary the game, erase "Add 1" and write "Subtract 2" or some other direction.

E. Teacher made tapes. Tape 1 could be used now. This tape has 40 word problems for addition facts with sums to 10. P. 2-18 has the answers for the teacher. Before starting the tape, have the children number a page 1-10 for their answer sheet.

F. Use Houghton Mifflin addition facts cards.

G. Use "Sum Fun" (commercial game)

H. There are many excellent games in "Let's Play Games in Mathematics", Vol. 1 and 2.

Level: 2 Step: A Concept: Addition

V. Activities: (Continued)

I. "Relay". The teacher writes a numeral such as 7 on the board. Designate an area on the board for each row of children. The first child in each row goes to the board and writes an addition combination totaling 7 and returns his seat. As quickly as possible each child in turn goes to the board and writes a different combination. After all the children have had a turn, give a point for each correct combination. Keep score by rows.

J. "Moving Up". The first child in the first row stands beside the second child's desk. Show both children a flash card. The one who gives the correct answer first, goes to stand beside the third child's desk. The one who misses must sit at his opponent's desk. Continue as long as you have time.

K. Put problems on the board, such as 3 + 2, 4 + 2, etc. Give the children a sheet of newsprint and some colored paper. Ask the children to write the problem, and show the problem by cutting out shapes from the colored paper and pasting them on the newsprint. The first problem might look like this:

3 + 2 △ △ △ + △ △ = 5

Text References:

Book: 1

Houghton Mifflin (1967) (41), 317.
Addison-Wesley (1971, 1968) pp. 109, (30), 110, 113, (32), 121, 125-126, (35), 139, (37), 140, (38), 199, (41), 200-202, 205-207, 223-226, 235.

Book: 2

Houghton Mifflin (1967) pp. 57, 63, 64, (10)
Addison-Wesley (1971, 1968) pp. 31-36, (11), 37-38, (12), 51, 53, 56-58, 77, 79

Book: 3

Houghton Mifflin (1967) pp. 32-38, (9, 10)
Addison-Wesley (1971, 1968) pp. 20-23. Supp. Ex. Set 1

Other References:

Countdown 17, 19

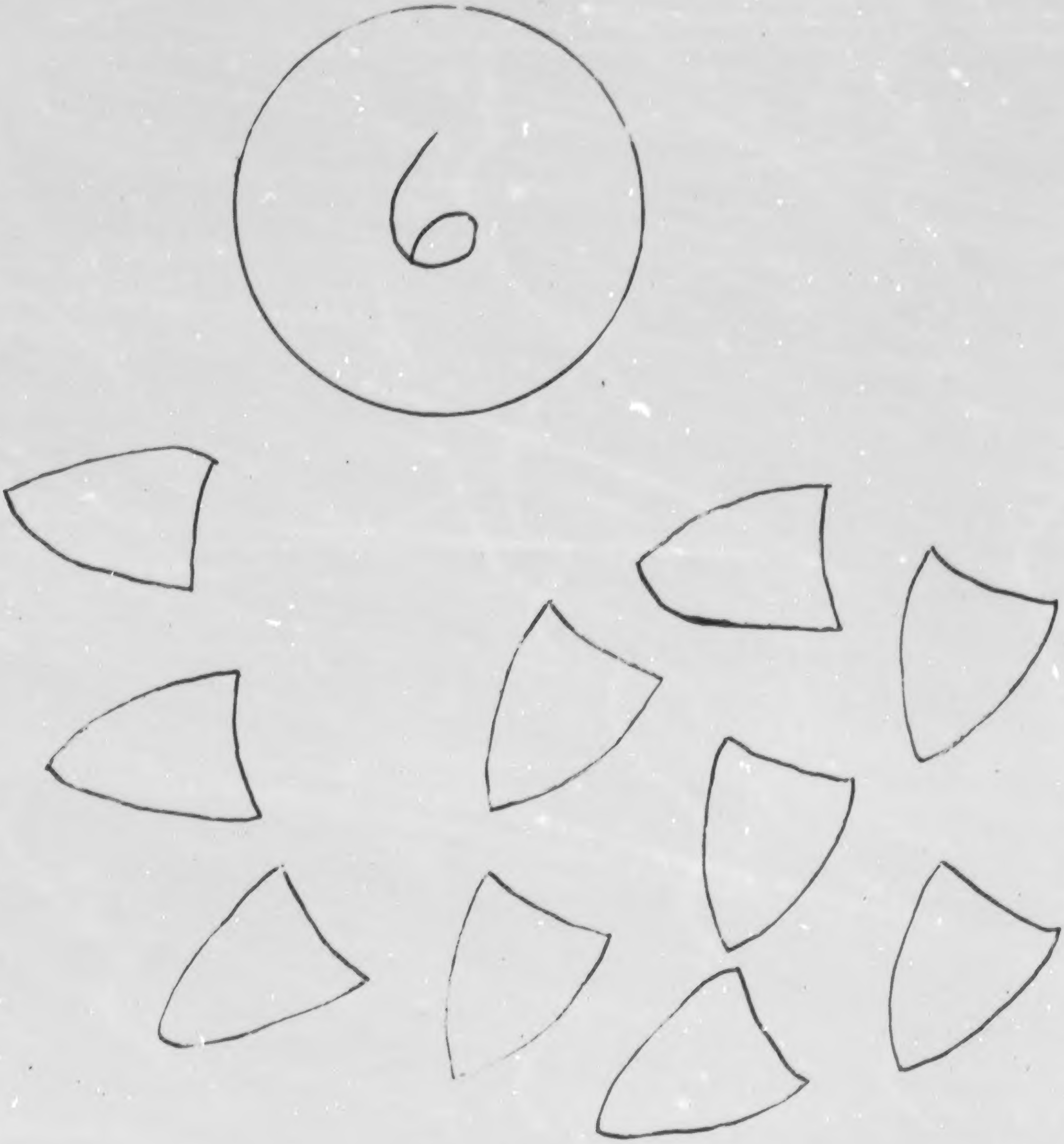
Imperial Tape #22 (Primary)

Modern Mathematics filmstrip #703
Addition -- Sums to 10 (Three addends are included)

Level: 2 Step: A Concept: Addition

Activity C

Have the children cut out the middle of the flower and paste it on another paper. After they write another name for six on a petal they may paste it on the flower. This may be used for other number families by omitting the six.



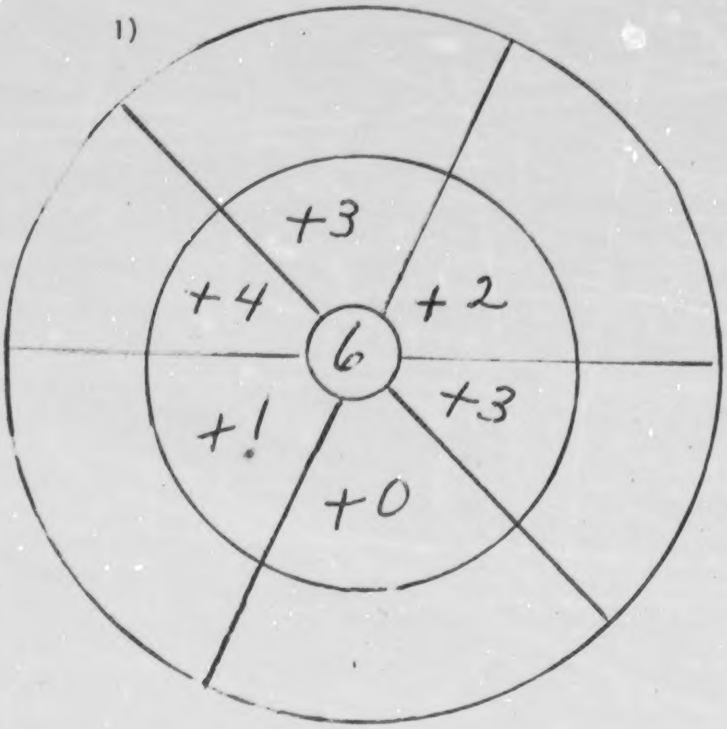
Level: 2 Step: A Concept: Addition

Activity C NAME________________________

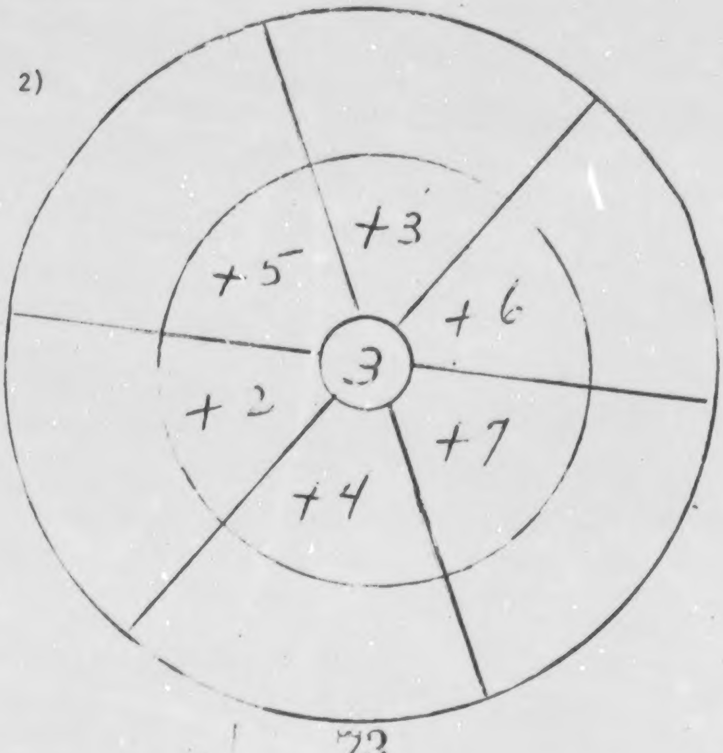
Add all numerals to the numeral in the center, and write the sums in the outside ring.

---

1)



2)



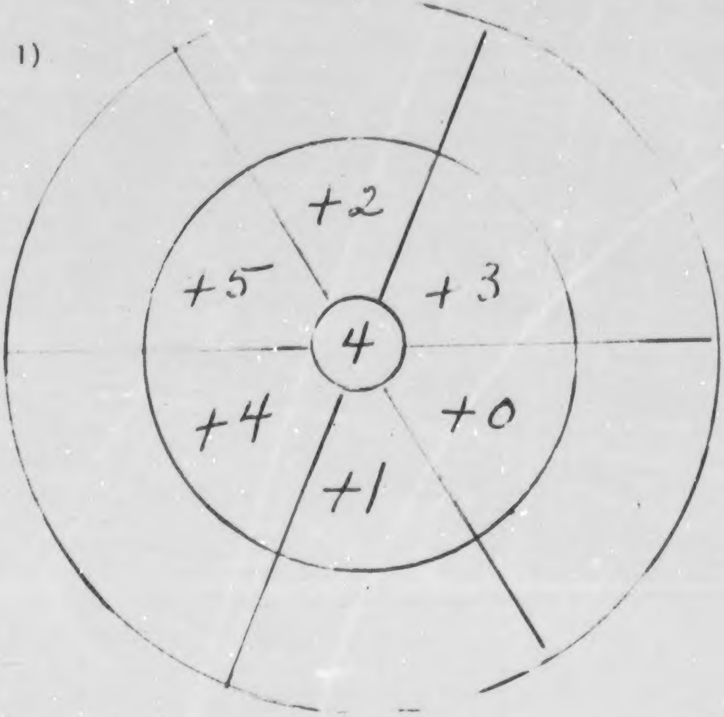
Level: 2 **Step:** A **Concept:** Addition

Activity C NAME______________________________

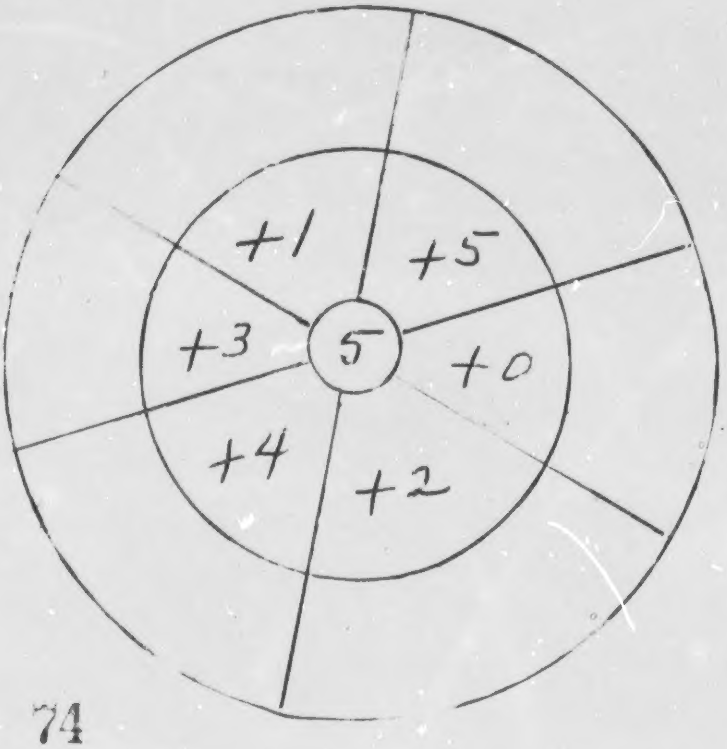
Add all numerals to the numeral in the center, and write the sums in the outside ring.

---

1)



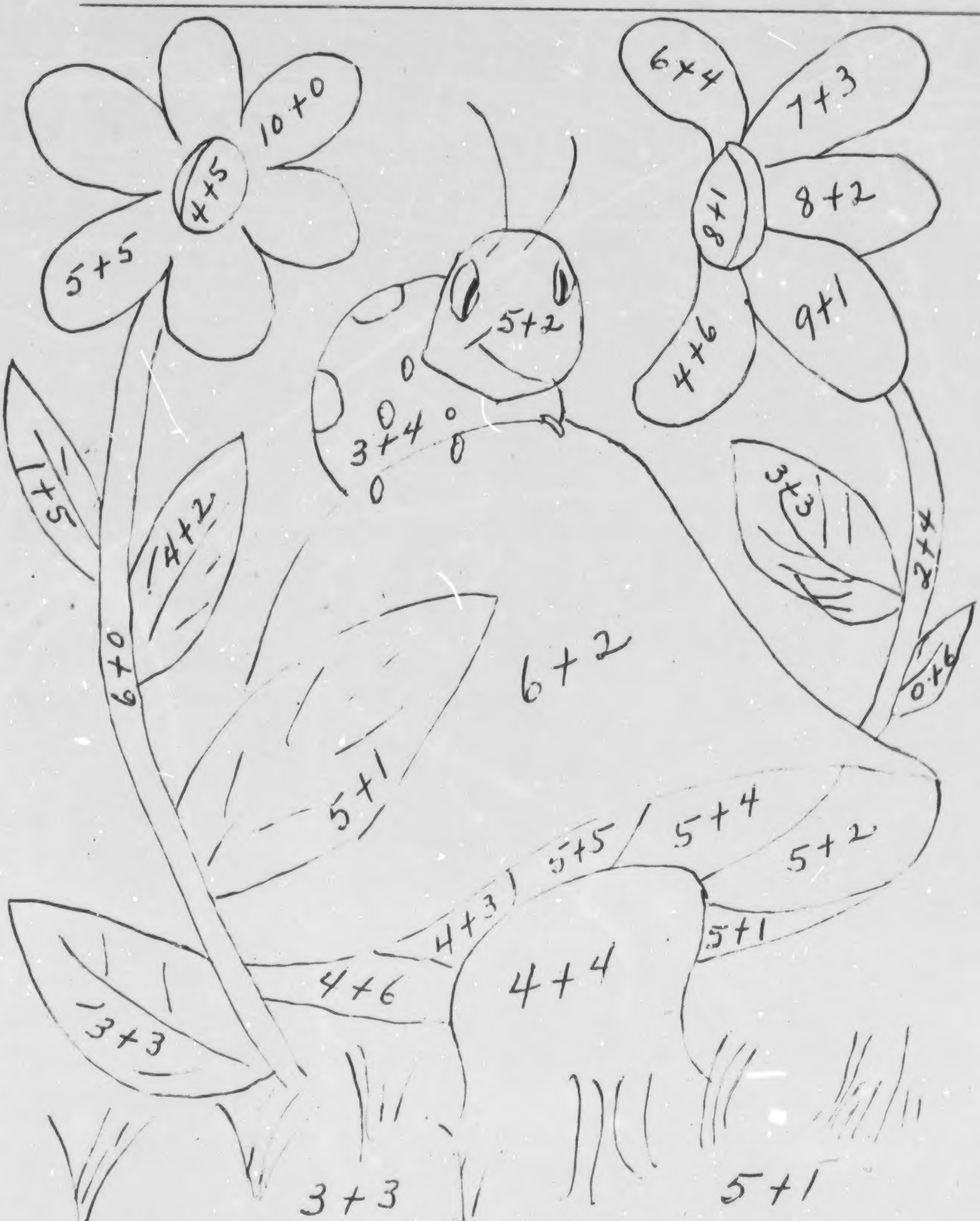
2)



2-14

Level: 2 Step: A Concept: Addition

Activity C NAME________________________


10+0
4+5
5+5
6+4
7+3
8+1
8+2
9+1
4+6
5+2
3+4
1+5
4+2
6+0
3+3
2+4
0+6
6+2
5+1
5+5
5+4
5+2
4+3
5+1
4+6
4+4
3+3
3+3
5+1

6 - green 7 - red 8 - brown 9 - yellow 10 - orange

Level: 2 Step: A Concept: Addition

Activity C NAME ____________________

---

1) 9 + 1 = ☐
2) 2 + 6 = ☐
3) 6 + 1 = ☐
4) 10 + 0 = ☐
5) 5 + 5 = ☐
6) 0 + 6 = ☐
7) 3 + 4 = ☐
8) 1 + 5 = ☐
9) 8 + 2 = ☐
10) 6 + 4 = ☐

---

11) $\begin{array}{r}4\\+4\\\hline\end{array}$ ☐

12) $\begin{array}{r}2\\+7\\\hline\end{array}$ ☐

13) $\begin{array}{r}5\\+3\\\hline\end{array}$ ☐

14) $\begin{array}{r}6\\+4\\\hline\end{array}$ ☐

15) $\begin{array}{r}4\\+2\\\hline\end{array}$ ☐

16) $\begin{array}{r}7\\+0\\\hline\end{array}$ ☐

17) $\begin{array}{r}2\\+5\\\hline\end{array}$ ☐

18) $\begin{array}{r}1\\+7\\\hline\end{array}$ ☐

19) $\begin{array}{r}9\\+0\\\hline\end{array}$ ☐

20) $\begin{array}{r}8\\+1\\\hline\end{array}$ ☐

21) $\begin{array}{r}5\\+4\\\hline\end{array}$ ☐

22) $\begin{array}{r}3\\+6\\\hline\end{array}$ ☐

23) $\begin{array}{r}2\\+8\\\hline\end{array}$ ☐

24) $\begin{array}{r}7\\+2\\\hline\end{array}$ ☐

25) $\begin{array}{r}3\\+7\\\hline\end{array}$ ☐

2-16

Level: 2 **Step:** A **Concept:** Addition

Activity C NAME ____________________

---

1) 6 + 2 = ☐

2) 3 + 5 = ☐

3) 8 + 1 = ☐

4) 5 + 2 = ☐

5) 1 + 7 = ☐

6) 4 + 0 = ☐

7) 9 + 1 = ☐

8) 3 + 7 = ☐

9) 4 + 2 = ☐

10) 5 + 1 = ☐

---

11) 4
+4
☐

12) 7
+2
☐

13) 6
+3
☐

14) 3
+3
☐

15) 2
+4
☐

16) 3
+4
☐

17) 5
+2
☐

18) 1
+6
☐

19) 2
+7
☐

Level: 2 Step: A Concept: Addition

Activity C NAME______________________________

Write X next to the equations that are not correct (or color them).

1) $3 + 4 = 6$

2) $4 + 2 = 6$

3) $5 + 5 = 10$

4) $4 + 3 = 10$

5) $6 + 2 = 7$

6) $2 + 6 = 8$

7) $1 + 9 = 9$

8) $0 + 6 = 6$

9) $4 + 5 = 9$

10) $5 + 1 = 6$

11) $5 + 2 = 8$

12) $3 + 3 = 7$

13) $7 + 0 = 8$

14) $5 + 3 = 8$

15) $7 + 2 = 10$

16) $10 + 0 = 10$

Level: 2 Step: A Concept: Addition

Activity E

ANSWER KEY FOR TAPE 1

Tape 1

Side 1
Part A

1. 3 + 7 = 10
2. 6 + 2 = 8
3. 3 + 3 = 6
4. 1 + 2 = 3
5. 4 + 1 = 5
6. 4 + 5 = 9
7. 3 + 4 = 7
8. 0 + 1 = 1
9. 2 + 2 = 4
10. 1 + 1 = 2

Tape 1

Side 1
Part B

1. 3 + 1 = 4
2. 5 + 2 = 7
3. 3 + 2 = 5
4. 6¢ + 4¢ = 10¢
5. 2 + 0 = 2
6. 6 + 3 = 9
7. 3 + 0 = 3
8. 4 + 4 = 8
9. 2 + 4 = 6
10. 3 + 5 = 8

Tape 1

Side 2
Part A

1. 2 + 1 = 3
2. 3 + 2 = 5
3. 5 + 5 = 10
4. 1 + 6 = 7
5. 2 + 7 = 9
6. 2 + 8 = 10
7. 2 + 2 = 4
8. 5 + 1 = 6
9. 2 + 5 = 7
10. 1 + 7 = 8

Tape 1

Side 2
Part B

1. 8 + 0 = 8
2. 3 + 3 = 6
3. 3 + 4 = 7
4. 8 + 2 = 10
5. 5 + 4 = 9
6. 2 + 3 = 5
7. 7 + 3 = 10
8. 1 + 8 = 9
9. 9 + 1 = 10
10. 6 + 1 = 7

Level: 2 Step: A Concept: Subtraction

I. Concept:

Subtraction: Finding the missing addend to ten.

II. Behavioral Objective:

The student given the sum and one addend both no greater than ten will be able to name the missing addend.

III. Mathematical Ideas:

A. Finding the missing addend is an introduction to subtraction.

B. Subtraction is the inverse of addition.

C. Subtraction is re-naming a sum and an addend as a missing addend.

IV. Vocabulary to Stress:

addend
missing addend
equals
minus
subtract
take away
part of a set

V. Activities:

A. Adapt all Activities from p. 1-27.

B. "Heads Up". Place 7-10 paper cups in a central position. Teacher asks, "How many?" The children put their heads on their desks while the teacher takes away some cups and then calls, "Heads Up". The child who gives the correct answer gets to be the leader.

C. "Santa's Mail". On a bulletin board display a large Santa and 3-10 grocery sacks for mail. Label each sack with a sum 3-10. Have the children bring old envelopes from home. Using the sums on the sacks, write combinations on the envelopes. Let the children take turns putting the mail in the correct sacks. This can be adapted for any holiday.

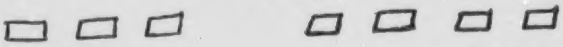
D. Draw a winding path on the board. Label 11 spots on the path 0-10 and draw an identifying landmark near each numeral, such as a tree, house, flower, mountain, etc. Tell the children we are trying to find buried treasure. Tell them you will write three clues on the board: 8 - 3, 2 + 3, 10 - 5. Call on a child to tell you what landmark the treasure is buried under and ask the class if they agree or disagree.

E. "Dinosaur Race." Make four small dinosaurs of different colors. Choose four teams matched by ability. Make a chart on the chalkboard with a row for each team and the same number of spaces in the row as children on the team. The dinosaurs advance along the row toward a distant water hole. The first member of each team goes to the board and the teacher dictates a problem. The child who gets the answer first moves his team's dinosaur forward one space. This game could be continued for several days if the interest is high.

Level: 2 Step: A Concept: Subtraction

F F. "Let's Play Games in Math" Vol. 1 - There are many excellent games listed in this book.

* G. Draw two sets on the board (or worksheet) such as:



Ask the children to write four equations for this set (3 + 4 = 7; 7 - 3 = 4; 4 - 3 = 7; 7 - 4 = 3). Use other sets. This could be done as a relay.

H. Tape II (Teacher made tapes) Answers are on p. 2-22. Before starting the tape have the children number a page 1-10 for an answer sheet. This tape has 40 word problems for missing addends to 10.

I. Use Houghton Mifflin equation cards and subtraction cards.

J. "Sum Fun" (commercial game)

* K. Use arithmablocks for graphic illustration of facts to 10.

Text References:

Book: 1

Houghton Mifflin (1967)	pp.	165-169, (26), 170, (27), 171-174, 180, 196, 219-223, (32), 225-226, (33), 227-229 (34), 230, (35), (36), 233-237, (38, 39), 239-240, (42), 242-244, (43) 291, 309.
Houghton Mifflin (1972)	pp.	149-154, (25, 26), 156-160, (28, 29, 31) 165-177, (32, 33), 179-183, 185-186, 188, 199-200, 250, 271 (37)
Addison Wesley (1971, 1968)	pp.	111-112, 114-120, (33), 122, 127-135, (36), 136-138, 141-147, (39), 148-150, (40), 151-152, 185-186, 203-204, (55, 56), 206, 208-212, (58), 213-214, (59), 215-218, (60), 222, (61, 63), 236-238, (66), 249.

Book: 2

Houghton Mifflin (1967)	pp.	29-31, (5, 6), 32, 39-41, (7), 42-43, 45-47, (8), 48, (9), 49-50, (10,11), 54, 56, 61-62, 78, 101-102.
Houghton Mifflin (1972)	pp.	35-39, (5-7), 41-45, (8-11), 48, 50, 53-56, 60, (12).
Addison-Wesley (1971, 1968)	pp.	39-44, (13), 45-46, (14), 47-49, (15), 50, (16), 52, 59-63, (20), 65, 66, 68, 70 (22).

Level: 2 Step: A Concept: Subtraction

Book: 3

Houghton Mifflin (1967) pp. 32-38, (9,10)
Houghton Mifflin (1972) pp. 27-36, (7-9)
Addison-Wesley (1971, 1968) pp. 20-26. Supp. ex. Set 3

Other References:

Countdown 27-29

Imperial Tape #3, #5 (Primary)

* Modern Mathematics Filmstrip

#704 (described on page 1-29)

#713 - Addition (missing addends). This filmstrip is concerned with some generalizations which some children find difficult to comprehend. Present the generalizations slowly, and allow sufficient time for response and discussion. (Use Phase one only.)

#715 - (Use phase one only) The children will benefit from manipulating sets of objects. Children should be urged to think of subtraction in terms of addition. If they know the addition "facts", subtraction involves no extra memorization.

* Suggested Introductory Activities

Level: 2 Step: A Concept: Subtraction

Activity H. ANSWER KEYS FOR TAPES

Tape 2

Side 1
Part A

1. 2 - 1 = 1
2. 10 - 2 = 8
3. 5 - 3 = 2
4. 6 - 4 = 2
5. 6 - 1 = 5
6. 8 - 2 = 6
7. 4 - 1 = 3
8. 5 - 2 = 3
9. 3 - 0 = 3
10. 10 - 5 = 5

Tape 2

Side 1
Part B

1. 3 - 3 = 0
2. 9 - 6 = 3
3. 7 - 4 = 3
4. 10 - 1 = 9
5. 9 - 5 = 4
6. 8 - 2 = 6
7. 1 - 1 = 0
8. 7 - 5 = 2
9. 8 - 6 = 2
10. 4 - 3 = 1

Tape 2

Side 2
Part A

1. 4 - 2 = 2
2. 6 - 2 = 4
3. 5 - 4 = 1
4. 7 - 2 = 5
5. 9 - 3 = 6
6. 6 - 5 = 1
7. 9 - 2 = 7
8. 10 - 3 = 7
9. 2 - 2 = 0
10. 5 - 1 = 4

Tape 2

Side 2
Part B

1. 8 - 7 = 1
2. 7 - 3 = 4
3. 7 - 7 = 0
4. 10 - 7 = 3
5. 3 - 2 = 1
6. 6 - 4 = 2
7. 8 - 2 = 6
8. 5 - 5 = 0
9. 9 - 1 = 8
10. 4 - 2 = 2

Level: 2 Step: A Concept: Geometry

I. Concept:

Geometry: Finding sets of points on, inside and outside a closed curve.

II. Behavioral Objective:

The student given simple curves will be able to identify the closed curves and locate points on the curve, outside the curve, and inside the curve.

III. Mathematical Ideas:

A. On a closed curve a continuous path may be traced back to the starting point.

B. In a closed curve points can be on the boundary, inside the region or outside the region.

IV. Vocabulary to Stress:

closed curve
inside
outside
on
points
curve
set of points
region

V. Activities:

* A. Using yarn or jumping ropes make two curves on the floor--one closed, one not closed. Ask the children what to call the curves. Remove the curve that is not closed and have a child stand inside the closed curve. Have another child stand outside the curve. The children should show that one cannot get outside and the other cannot get inside without stepping over the curve. Then have one child stand on the curve and ask the children where he is standing. (Bring out the term "on".) Using six circles labeled with letters, place points inside, outside and on the curve. On the chalkboard write the words "On", "Inside", and "Outside" and have the children write the name of the point next to the correct word. Repeat several times.

B. Using the lettered circles, place six points on the floor. Using the yarn have a child form a closed curve according to directions written on the board, such as On--ACD, Inside--B, Outside--EF. Repeat several times changing directions each time.

C. Instead of using the floor you might like to use the flannel board, yarn and cut-outs.

D. Make a ditto showing several closed curves. (Number the curves.) Give directions such as: on curve one, put a point inside the curve and label the point X; on curve two, put a point inside the curve and label it O; and a point on the curve and label it B. Continue using points inside, outside, and on. See examples on 2-25 and 2-26.

Level: 2 Step: A Concept: Geometry

V. Activities: (Continued)

E. Houghton Mifflin Geoboard Cards #4, 8, 23.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 183-188
Houghton Mifflin (1972) pp. 189-190
Addison-Wesley (1971, 1968) (87, 88)

Book: 2

Houghton Mifflin (1967) pp. 218, 226, 227
Houghton Mifflin (1972) pp. 217
Addison-Wesley (1971, 1968) (81, 82, 85)

Other References:

*Modern Mathematics Filmstrip

#710 - This is a lesson on simple closed curves. Phase one deals with the fact that a closed curve has an inside and an outside. Phase two is devoted to circles, triangles, and rectangles.

#716 - In this lesson students are introduced to some properties of simple geometric figures. This lesson is divided into two phases which may be presented on two consecutive days. (This film-strip included properties of a cube which does not apply.)

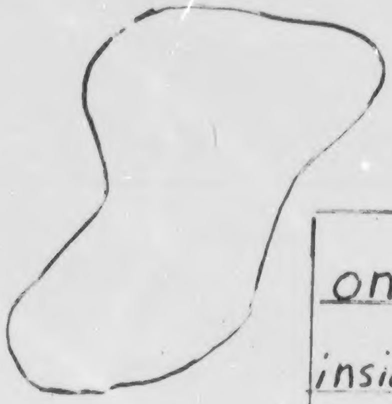
* Suggested Introductory Activities

Level: 2 Step: A Concept: Geometry

Activity D NAME____________________

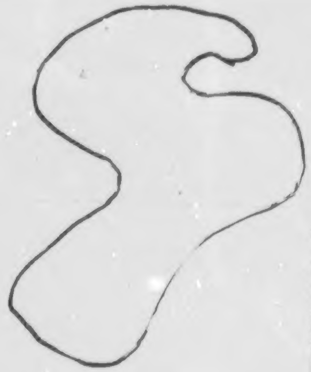
Using the boxes, place points as directed.

1.



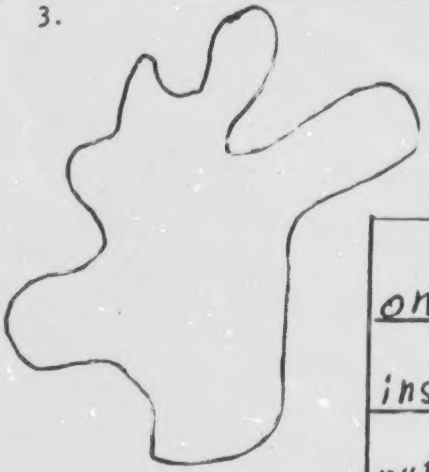
on	A, L
inside	S, R
outside	T, U

2.



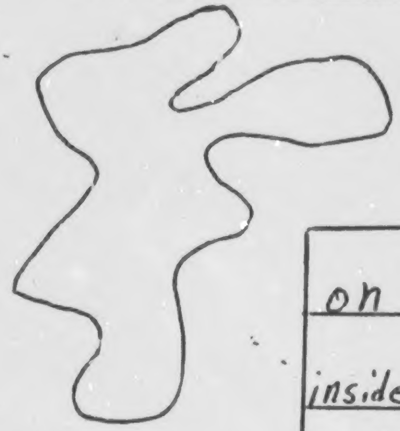
on	B, E
inside	C, H
outside	J, D

3.



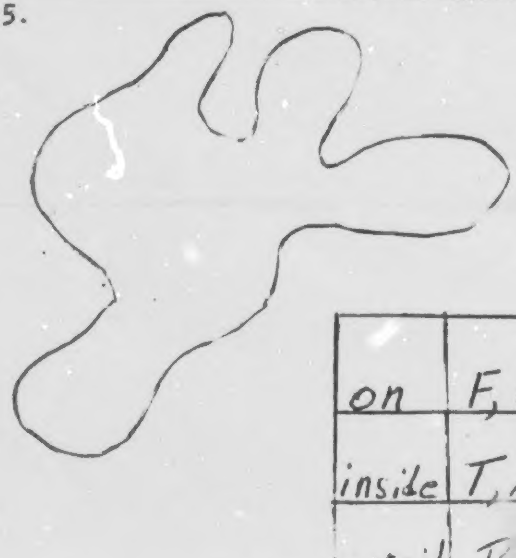
on	F, L
inside	G, K
outside	M, O

4.



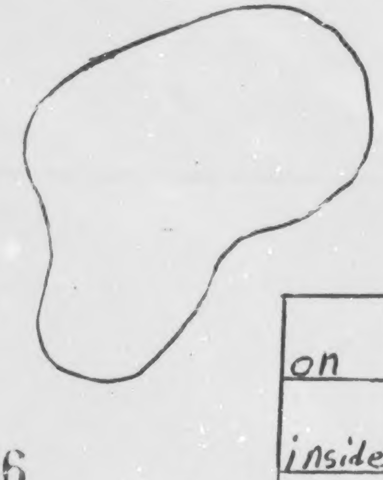
on	P, V
inside	Z, I
outside	N, W

5.



on	F, O
inside	T, M
outside	R, K

6.



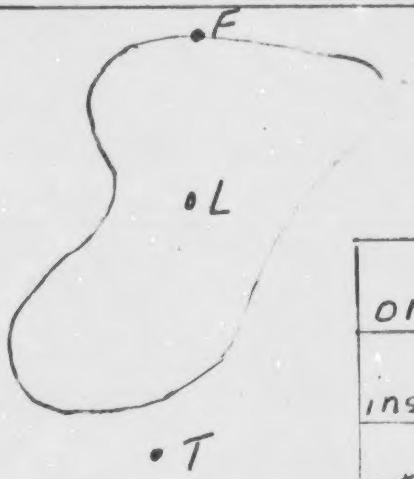
on	S, B
inside	D, F
outside	M, C

Level: 2 Step: A Concept: Geometry

Activity D NAME

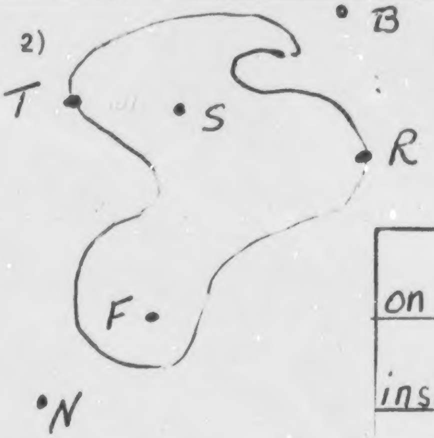
Write the letter that is on, inside, or outside the curve in the correct box.

1)



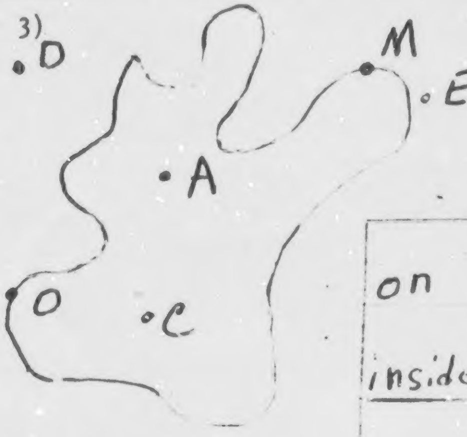
on	
inside	
outside	

2)



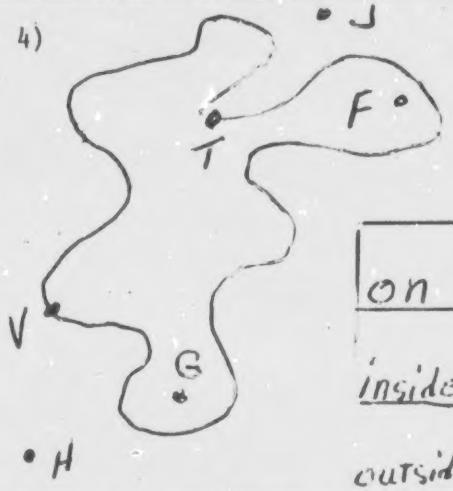
on	
inside	
Outside	

3)



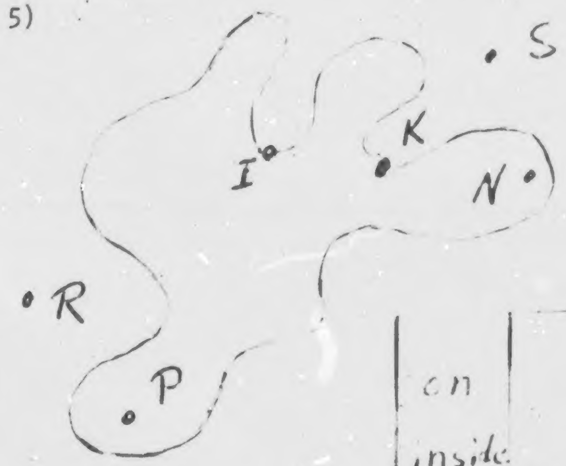
on	
inside	
outside	

4)



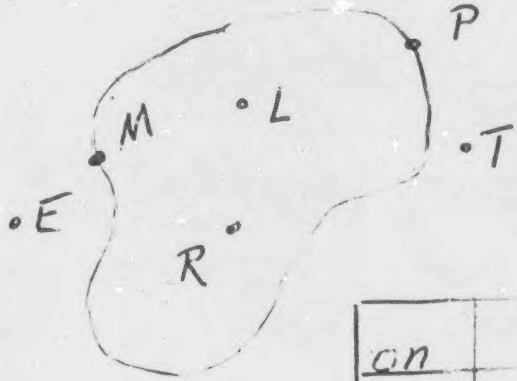
on	
inside	
outside	

5)



on	
inside	
outside	

6)



on	
inside	
outside	

Level: 2 Step: A Concept: Measurement

I. Concept:

Measurement: Telling time to the hour.

II. Behavioral Objective:

The student given a clock will be able to tell the hour.

III. Mathematical Ideas:

A. The numerals on a clock form a circular number line.

B. Measurement of time is indirect and involves the movement of an object from one set place to another.

IV. Vocabulary to Stress:

clock hour hands face time o'clock

V. Activities:

* A. To show that numerals on a clock form a circular number line, draw a 12 unit number line on a flexible strip and bend the strip to form a circle. Then draw two lines, one straight and one circular each with twelve units. Then have the children write the numerals on the lines at the same time.

B. Use Clocks from "Tell Time Quizmo" or make a ditto of a clock face showing the numerals and a set of hands. The clock face could be the diameter of a paper plate or a plastic lid. Have the children cut out the face and hands and paste the face on the plate or lid. Then the children should paste the hour hand on a piece of blue construction paper and the minute hand on a piece of red construction paper and cut them out again. Fasten the hands to the clock with brads. Use these clocks to practice finding the hours. (Save them to use in teaching the half hour).

* C. Have the class watch the clock in your room to see which way the hands move. Have the children use their finger to show which way the clock goes. Explain that while the second hand moves around the face once, the minute hand moves one dot and that is why it is called a minute hand. Also, explain that while the minute hand is moving around the face once, the hour hand is moving from one hour to the next.

D. Use examples on 2-29 and 2-30.

E. "Let's Play Games in Mathematics", Vol. 1, Game 18. (Adapt for telling time to the hour).

F. Tell Time Quizmo

Level: 2 Step: A Concept: Measurement

Text Reference:

Book: 1

Houghton Mifflin (1967) pp. 115-116
Houghton Mifflin (1972) pp. 119-120
Addison-Wesley (1971, 1968) pp. 195-197

Book: 2

Houghton Mifflin (1967) p. 85
Houghton Mifflin (1972) p. 83

Other References:

Modern Mathematics filmstrip #709
This filmstrip is a good approach for understanding the clock. Parts are a little advanced.

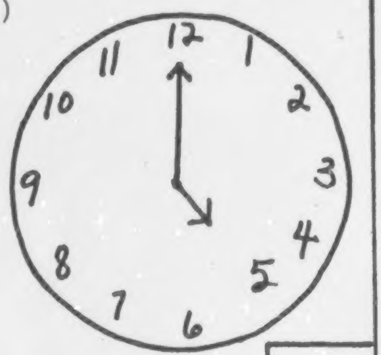
* Suggested Introductory Activities

Level: 2 Step: A Concept: Measurement

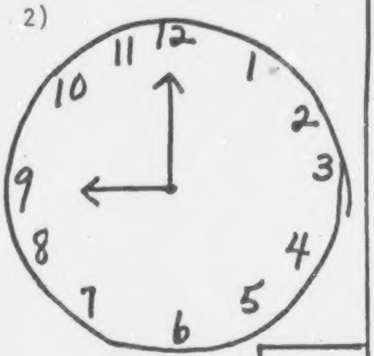
Activity D NAME

Write the numeral in the box.

1)


12
1
2
3
4
5
6
7
8
9
10
11

2)


12
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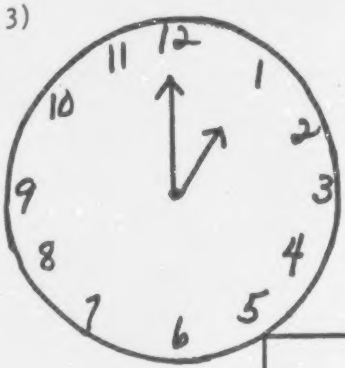
11

3)


12
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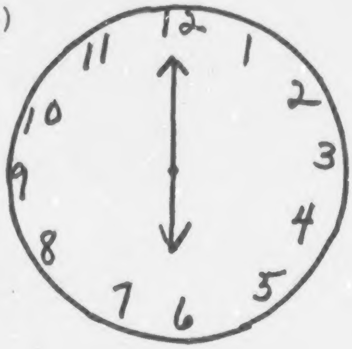
11

4)


12
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4
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6
7
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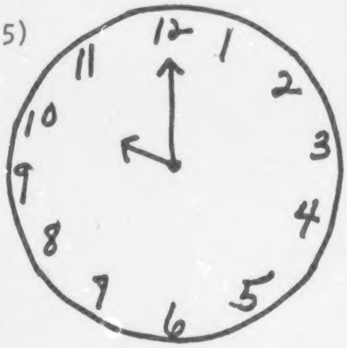
10
11

5)


12
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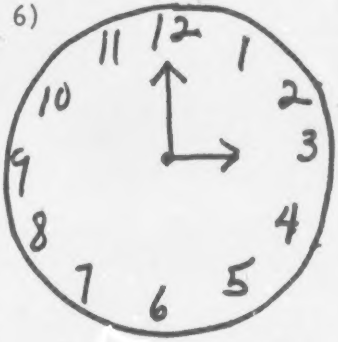
10
11

6)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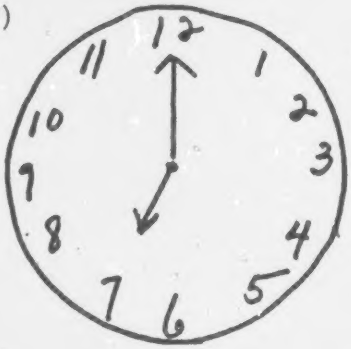
10
11

7)


12
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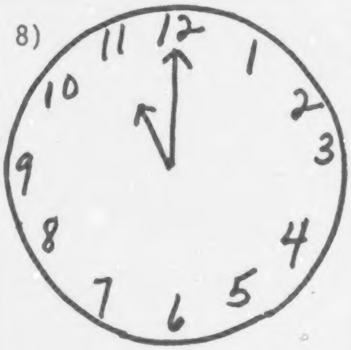
8)


12
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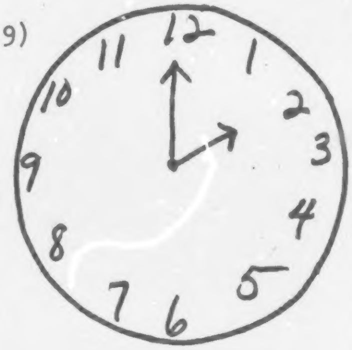
9)


12
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2
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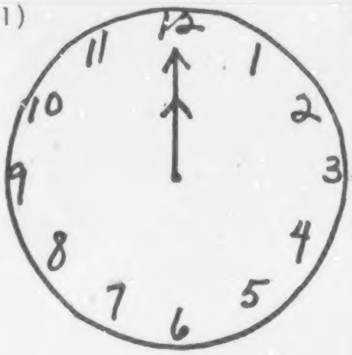
11

Level: 2 Step: A Concept: Measurement

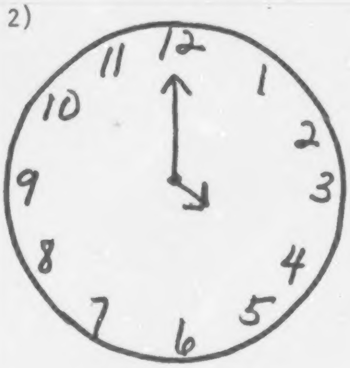
Activity D NAME______________________________

Write the numeral in the box.

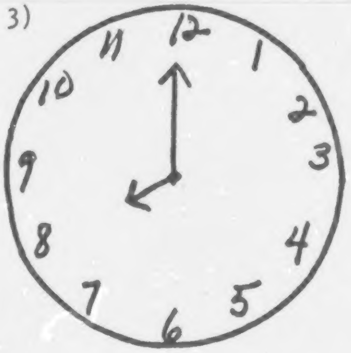
1)



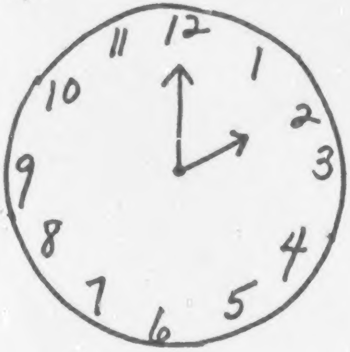
2)



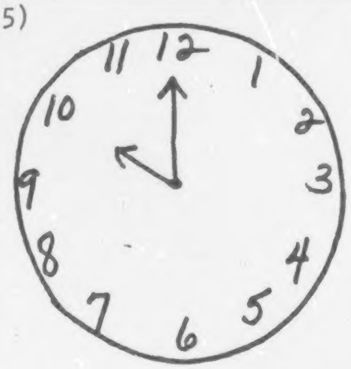
3)



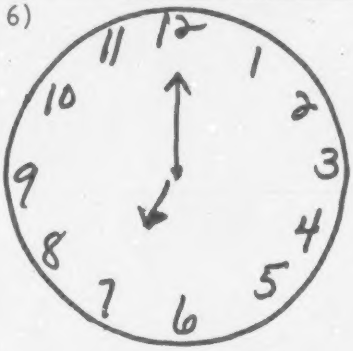
4)



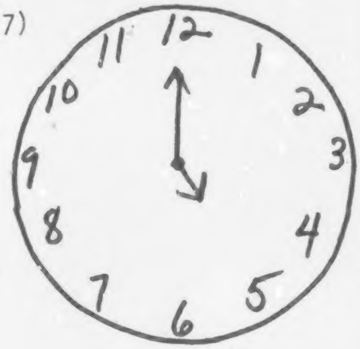
5)



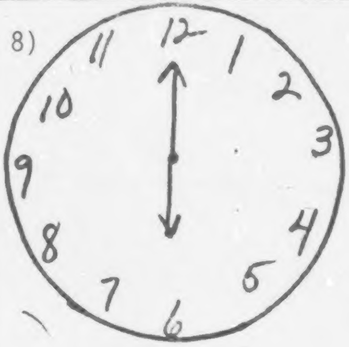
6)



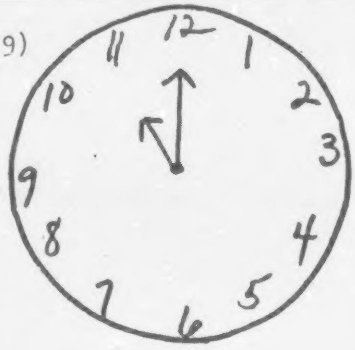
7)



8)



9)



Level: 2 Step: B Concept: Numeral

I. Concept:

Numeral: Recognizing odd and even numbers.

II. Behavioral Objective:

The student given a set of numbers 0-20 will be able to identify the odd and even numbers.

III. Mathematical Ideas:

A. An even number is any whole number which is exactly divisible by two.

B. An odd number is any whole number which is not exactly divisible by two.

IV. Vocabulary to Stress:

odd even leftover divide

V. Activities:

* A. Distribute counters to the children giving one to the first child, two to the second, etc. On the chalkboard mark two columns--one labeled sets of two, the other--sets of two with one leftover. Tell the children to separate their counters into sets of two. Begin with the child who has one counter and help him write the numeral in the proper column. When all the numerals have been recorded, introduce the terms "even" and "odd". Ask the children if zero is even or odd. Discuss that when zero is separated into two sets there are none left over. Also, zero can be separated into two sets of zero. So, zero is an even number.

* B. Make a grid on the board or a transparency for the overhead projector having ten rows and ten columns. Make a ditto for the children showing the same grid. With a pencil the children should fill in their grid at their desks while the teacher fills in the transparency. Starting with zero, fill in the even numbers with the children telling you what to write. Say all the even numbers in unison. Change to a different color and begin filling in the odd numbers with the children's help. See example on 2-33.

C. Use teacher made dittos. See examples on 2-34 through 2-36.

* D. Help the children discover a method of determining whether any two-place number is even or odd. Have the children use counters and/or count to discover that if a numeral has 2, 4, 6, 8, or 10 in the ones' place it is even; if it has 1, 3, 5, 7, or 9 in the ones' place it is an odd number.

Level: 2 Step: B Concept: Numeral

V. Activities: (Continued)

E. Divide the class into two teams. Name one team Odd and one team Even. The first member of each comes forward and the two children stand back-to-back. Each child holds up any number of fingers (his opponent must not peek). Everyone else counts the fingers and adds the two numbers together. If the number is odd, the Odd team gets the point, if the number is even, the Even team gets a point.

F. Write numerals 0-20 on balloons. Tape the balloons to a convenient surface. Point to a balloon and call on a child to tell you if the number is even or odd. If he knows, he gets the balloon.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 311-314
Houghton Mifflin (1972) pp. 301-304 (57)
Addison-Wesley (1971, 1968) pp. 269-270

Book: 2

Addison-Wesley pp. 241-244

Other References:

Modern Mathematics Filmstrip #723 (last phase)

This filmstrip can be used for enrichment. First phase is on number sequences. Second phase is on odd and even numbers.

*Suggested Introductory Activities

Level: 2 Step: B Concept: Numeral

Activity B NAME________________________________

Level: 2 Step: B Concept: Numeral

Activity C

Put a ring around the even numerals.

1) 10	2) 2	3) 15	4) 16
18	7	0	19
5	14	4	1
17	6	11	3
13	9	20	2

Level: 2 Step: B Concept: Numeral

Activity C

Put a ring around the odd numerals.

1) 1	2) 2	3) 5	4) 10
6	7	16	13
19	18	9	15
4	3	12	8
3	20	11	17

Level: 2 Step: B Concept: Numeral

Activity C NAME____________________

Write the numerals in the boxes.

1)	0		4		
2)	1			7	
3)		10			
4)	11			17	
5)			16		
6)	4				

Level: 2 Step: B Concept: Order

I. Concept:

Order: Recognizing the inequality of two two-digit numerals.

II. Behavioral Objective:

The student given a two-digit numeral and a sign "<", ">", or " = " will be able to show a number that is one greater, one less or equal to the given number.

III. Mathematical Ideas:

A. The order of cardinal numbers is expressed through use of "<" and ">".

B. If two cardinal numbers are the same, they are equal. The equality is expressed through use of " = ".

IV. Vocabulary to Stress:

greater than less than fewer more than equal

V. Activities:

A. Adopt Activities on p. 1-16.

B. Use teacher made dittos. See examples on 2-38 and 2-39.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 135, 148
Houghton Mifflin (1972) p. 134
Addison-Wesley (1971, 1968) pp. 187-188, (51), 189-190, (52), 191-192

Book: 2

Addison Wesley (1971, 1968) pp. 18-20,178, (5, 6, 7)

Other References:

Modern Mathematics filmstrip #705 (described on page 2-5)

Level: 2 Step: B Concept: Order

Activity B NAME____________________________

Write the numerals that come before and after the numeral given.

1)		18	
2)		41	
3)		57	
4)		91	
5)		35	
6)		27	
7)		84	
8)		69	
9)	14		
10)			22
11)	67		
12)			31
13)	64		
14)			44
15)	89		
16)			13

Level: 2 Step: B Concept: Order

Activity B NAME________________________

Write the sign ("   ", "   ", " = ") in the ring and the missing numeral in the box.

1) 23 ○ 24

2) 16 ○ 15

3) 36 ○ 32

4) ☐ 63 ☐

5) 15 ○ 15

6) ☐ 47 ☐

7) 75 ○ 74

8) 55 ○ 55

9) 69 ○ 70

10) ☐ 26 ☐

11) 82 ○ 81

12) ☐ 52 ☐

Level: 2 Step: B Concept: Addition

I. Concept:

Addition: Adding three addends with sums less than ten.

II. Behavioral Objective:

The student given three addends will be able to name the sum using basic facts to ten.

III. Mathematical Ideas:

A. Addition is a binary operation.

B. The way in which addends are grouped does not affect the sum. For example (4 + 3) + 2 = 4 + (3 + 2) = 9

IV. Vocabulary to Stress:

sum addend parentheses

V. Activities:

A. Give three children numeral cards that have a sum of 10 or less. Have a child replace two children with the card which is the sum of the cards the two children hold. Have another child choose a card to name the sum. Repeat this activity.

B. Write a problem on the chalkboard using three addends (sums to 10). The teacher says, "Can you add three numbers at the same time?" If no one knows, put parenthesis around two of the numbers and explain that you can add only two numbers at one time. Then show the children how to work the problem. Send a row of children to the chalkboard and dictate a problem. Have the children use their hands to frame the numbers they are going to add first. Discuss that you may add either the first two or the last two. Tell them to finish the problem. The other children may do this activity with pencil and paper.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 85, 175-179, (28, 31), 181-182, 197, 215-218, 224, 232, (37).
Houghton Mifflin (1972) pp. 161-164, 178, 187, 201 (27, 30)
Addison-Wesley (1971, 1968) pp. 227-228, (64), 229-234, (65).

Book: 2

Houghton Mifflin (1967) pp. 33-38, (4), 89.
Houghton Mifflin (1972) pp. 31-34, (4), 92.
Addison-Wesley (1971, 1968) pp. 143-144

Other References:

Modern Mathematics Filmstrip #703 (described on p. 2-10)

Level: 1 Step: B Concept: Measurement

I. Concept:

Measurement: Communicating measure through the use of non-standard units.

II. Behavioral Objective:

The student given a non-standard unit of measure, will be able to determine the number of units between two given points.

III. Mathematical Ideas:

A. A measurement is a description based on comparison. All measurement is approximate.

B. A unit measure may be any designated length.

C. To measure the length of a line segment, compare it with a unit of designated length and find how many units the line segment equals.

IV. Vocabulary to Stress:

length line segment unit measure

V. Activities:

* A. Hold up two pencils of different lengths, and ask the children which is shorter and which is longer. Compare other pairs in the room such as chalk, crayons, books and children.

* B. Try differenct units of measure. First have each child measure the width of his desk using his hands as a unit of measure. Be sure to show him where to start. Ask why there are different answers. Then have each child measure his desk with his pencil. Again ask why the answers are different. Next use anything available: erasers, chalk, string, paper clips or books. (Children may be interested in knowing a horse is measured by how many hands high).

* C. Introduce and explain the term "line segment". Draw a line on the chalkboard. Divide it into segments. Label points. Ask a child to give the number of line segments between any two named points. If he answers correctly he asks a second child to name the number of line segments between two points he names. The child answering correctly becomes the leader.

Level: 2 Step: B Concept: Measurement

V. Activities: (Continued)

D. Draw chalk line on floor. Divide it into line segments. Label points. Ask a child the number of line segments between two named points.

E. "Let's Play Games in Mathematics: Vol. 1 - #3 and #112.

F. Use example p. 2-43.

G. An interesting bulletin board can be made by displaying different units of measure showing the length of the board. Title the board "How Long Is This Bulletin Board?". Using beans, paper clips, egg cartons, hands and feet of children, and other objects, show the length of the board. Label each row with the number of objects. (This can be done at a station).

Text References:

Book: 1

Houghton Mifflin (1967) pp. 205-206
Addison-Wesley (1971, 1968) pp. 281

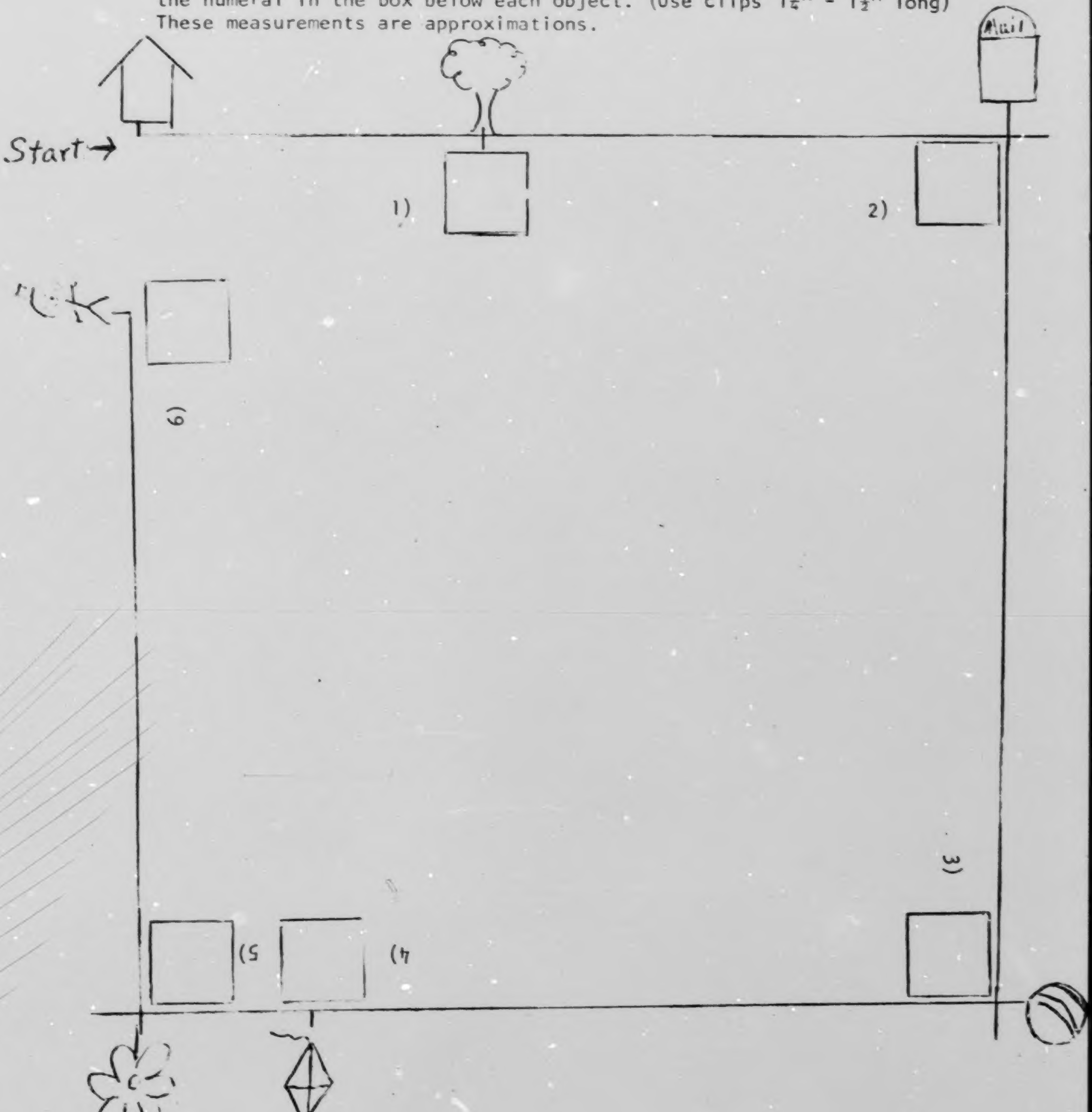
Other References:

Modern Mathematics filmstrip #717 (Phase one)
Modern Mathematics filmstrip #711
Phase one, students work with non-standard units of measure, such as blocks, pencils, and sticks. Phase two deals with the inch and Phase three with volume.

* Suggested Introductory Activities

Level: 2 Step: B Concept: Measurement

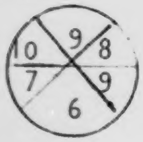
Use paper clips to measure the distance between objects. Write the numeral in the box below each object. (Use clips 1¼" - 1½" long) These measurements are approximations.



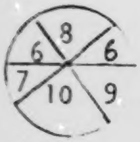
ANSWERS TO WORKSHEETS

2-12

1)

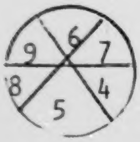


2)

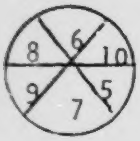


2-13

1)



2)



2-14

Stems
leaves } green
grass

right flower } - red
bug

bell (inside) } - orange
left flower

bell stem } - brown
bell flower

flower center - yellow

2-15

1. 10
2. 8
3. 7
4. 10
5. 10
6. 6
7. 7
8. 6
9. 10
10. 10
11. 8
12. 9
13. 8
14. 10
15. 6
16. 7
17. 7
18. 8
19. 9
20. 9
21. 9
22. 9
23. 10
24. 9
25. 10

2-16

1. 8
2. 8
3. 9
4. 7
5. 8
6. 4
7. 10
8. 10
9. 6
10. 6
11. 8
12. 9
13. 9
14. 6
15. 6
16. 7
17. 7
18. 7
19. 9

2-17

1. X
2.
3.
4. X
5. X
6.
7. X
8.
9.
10.
11. X
12. X
13. X
14.
15. X
16.

2-26

1. on - F.
in - L.
out - T

2. on - T. R.
in - S. F.
out - B. N.

3. on - M. O.
in - A. C.
out- D. E.

4. on - V. T.
in - G. F.
out - H. J.

5. on - I. K.
in - P. N.
out - R. S.

6. on - M. P.
in - R. L.
out - E. T.

ANSWERS TO WORKSHEETS

2-29

1. 5
2. 9
3. 1
4. 6
5. 10
6. 3
7. 7
8. 11
9. 2

2-30

1. 12
2. 4
3. 8
4. 2
5. 10
6. 7
7. 5
8. 6
9. 11

2-34

1) 10, 18
2) 2, 14, 6
3) 0, 4, 20
4) 16, 2

2-35

1) 1, 19, 13
2) 7, 3
3) 5, 9, 11
4) 13, 15, 17

2-36

1) 2, 6, 8
2) 3, 5, 9
3) 8, 12, 14, 16
4) 13, 15, 19
5) 12, 14, 18, 20
6) 6, 8, 10, 12

2-38

1) 17, 19
2) 40, 42
3) 56, 58
4) 90, 92
5) 34, 36
6) 26, 28
7) 83, 85
8) 68, 70
9) 15, 16
10) 20, 21
11) 68, 69
12) 29, 30
13) 65, 66
14) 42, 43
15) 90, 91
16) 11, 12

2-39

1. <
2. >
3. >
4. 62, 64
5. =
6. 46, 48
7. >
8. =
9. <
10. 25, 27
11. >
12. 51, 53

2-43

1. 2
2. 3
3. 5
4. 4
5. 1
6. 4

TABLE OF CONTENTS

Level 3

Step A

1. Addition: Sums to twelve 3-1
2. Subtraction: Finding the missing addend to twelve. 3-8
3. Function: Introducing picture and bar graphs 3-10
4. Measurement: Linear measure: inch 3-13

Step B

1. Numeral: One-half and one-fourth (region). 3-17
2. Addition: Expanded notation. 3-21
3. Measurement: Time: half hour. 3-25

Step C

1. Addition: Two-digit addends (Basic facts to 9). 3-29
2. Subtraction: Finding the missing addend. with two digit numbers. 3-33
3. Measurement: Linear measure: half-inch. 3-34

Answers to Worksheets 3-37

Level: 3 Step: A Concept: Addition

I. Concept:

Addition: Naming sums to twelve.

II. Behavioral Objective:

The student given two addends will be able to name a sum no greater than twelve.

III. Mathematical Ideas:

A. Addition involves two numbers (binary operation).

B. There are many names for any number.

C. Addition requires naming a sum.

D. The order of the addends does not affect the sum.

IV. Vocabulary to Stress:

sum	plus	addend	equal
add	join	addition	number family

V. Activities:

A. Adapt activities from p. 1-22 and p. 2-9 if needed.

B. Egg cartons could be used to show visually all the combinations to twelve.

C. Use teacher made dittos. See examples on pages 3-2 through 3-7.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 302, 305, 318 (55)
Houghton Mifflin (1972) pp. 261, 267, 281, 291

Book: 2

Houghton Mifflin (1972) pp. 109, 122

3-2

Level: 3 Step: A Concept: Addition

Activity C NAME____________________

Write the sum in the box.

1) 12 + 0 ☐	2) 6 +5 ☐	3) 7 +4 ☐	4) 9 +3 ☐
5) 3 +8 ☐	6) 2 +10 ☐	7) 6 +6 ☐	8) 4 +7 ☐
9) 2 +9 ☐	10) 5 +7 ☐	11) 0 +11 ☐	12) 4 +8 ☐
13) 10 + 1 ☐	14) 5 +6 ☐	15) 8 +4 ☐	16) 3 +9 ☐
17) 7 +5 ☐	18) 1 +11 ☐	19) 10 + 2 ☐	20) 8 +3 ☐
21) 1 +10 ☐	22) 9 +2 ☐	23) 11 + 1 ☐	24) 0 +12 ☐

Level: 3 Step: A Concept: Addition

Activity C NAME ____________________

Write the sum in the box.

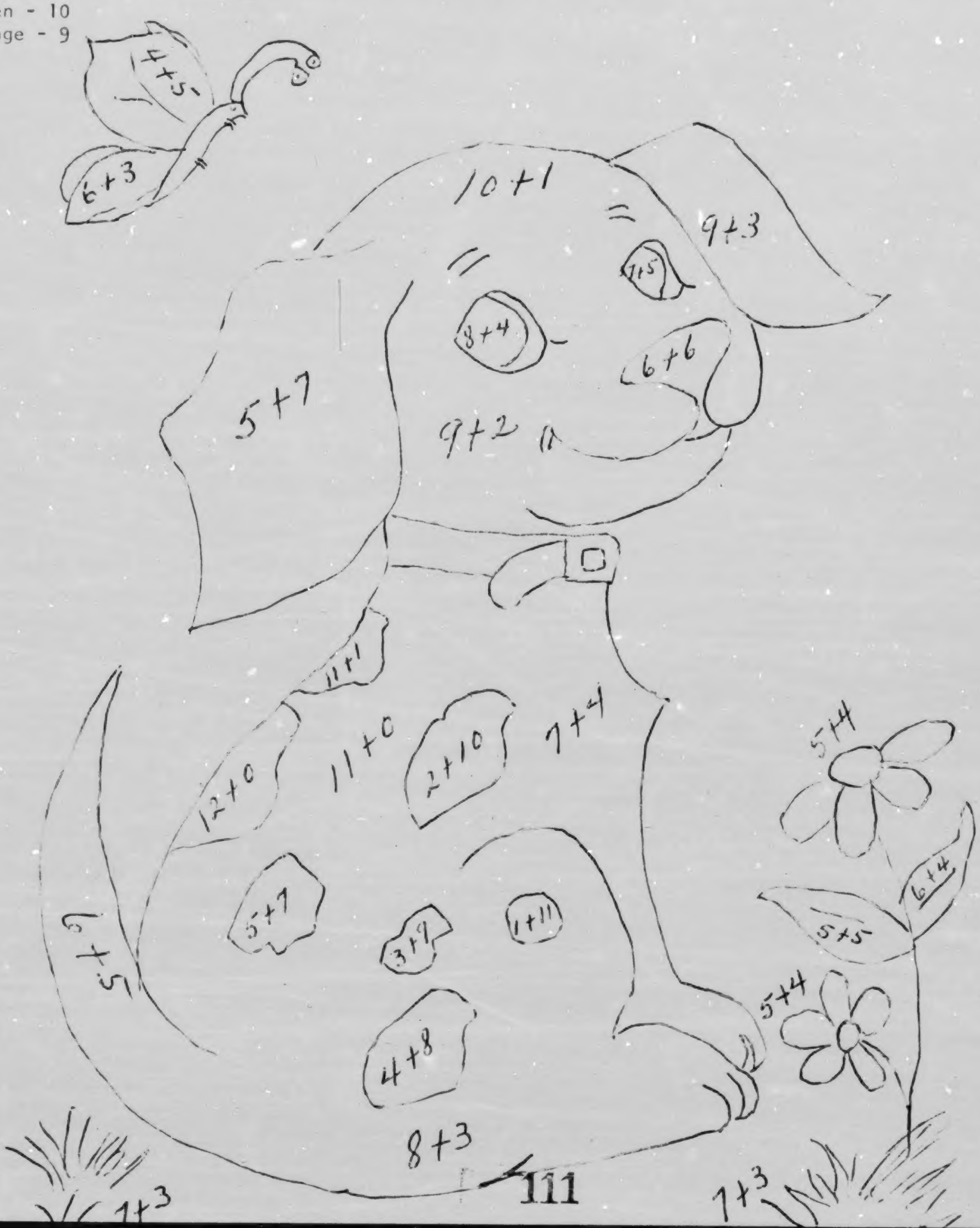
1) 12 + 0 = ☐	2) 9 + 2 = ☐
3) 6 + 5 = ☐	4) 7 + 4 = ☐
5) 3 + 9 = ☐	6) 11 + 1 = ☐
7) 1 + 10 = ☐	8) 5 + 6 = ☐
9) 8 + 3 = ☐	10) 10 + 2 = ☐
11) 0 + 11 = ☐	12) 9 + 3 = ☐
13) 4 + 8 = ☐	14) 0 + 12 = ☐
15) 7 + 5 = ☐	16) 3 + 8 = ☐
17) 6 + 6 = ☐	18) 10 + 1 = ☐

3-4

Level: 3 Step: A Concept: Addition

Activity C NAME______________________________

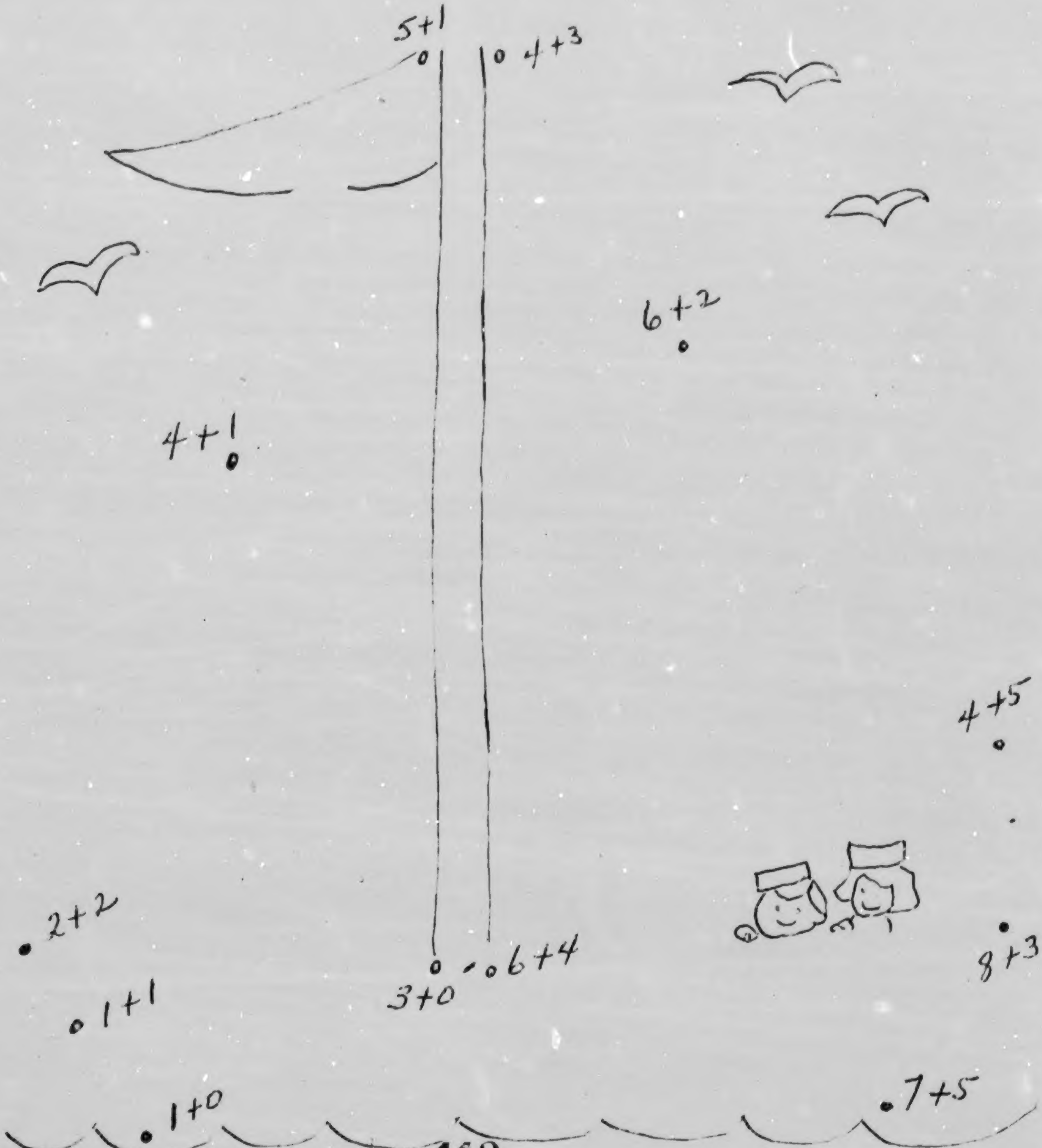
Black - 12
Brown - 11
Green - 10
Orange - 9


4+5
6+3
10+1
9+3
7+5
8+4
6+6
5+7
9+2
11+1
7+4
11+0
2+10
12+0
5+4
5+7
3+9
1+11
6+4
5+5
6+5
5+4
4+8
8+3
7+3
7+3

Level: 3 Step: A Concept: Addition

Activity C NAME ____________________

Work the equations and follow the dots.


5+1
4+3
6+2
4+1
4+5
2+2
6+4
3+0
8+3
1+1
7+5
1+0

3-6

Level: 3 Step: A Concept: Addition

Activity C NAME ____________________

Write an X beside the incorrect equation(or color it).

1) 12 + 0 = 12

2) 12 + 2 = 12

3) 6 + 5 = 12

4) 7 + 4 = 11

5) 3 + 8 = 12

6) 2 + 8 = 11

7) 3 + 9 = 11

8) 4 + 8 = 11

9) 1 + 11 = 12

10) 6 + 4 = 11

11) 3 + 8 = 11

12) 9 + 2 = 12

13) 0 + 11 = 11

14) 10 + 1 = 11

15) 6 + 6 = 10

16) 10 + 2 = 11

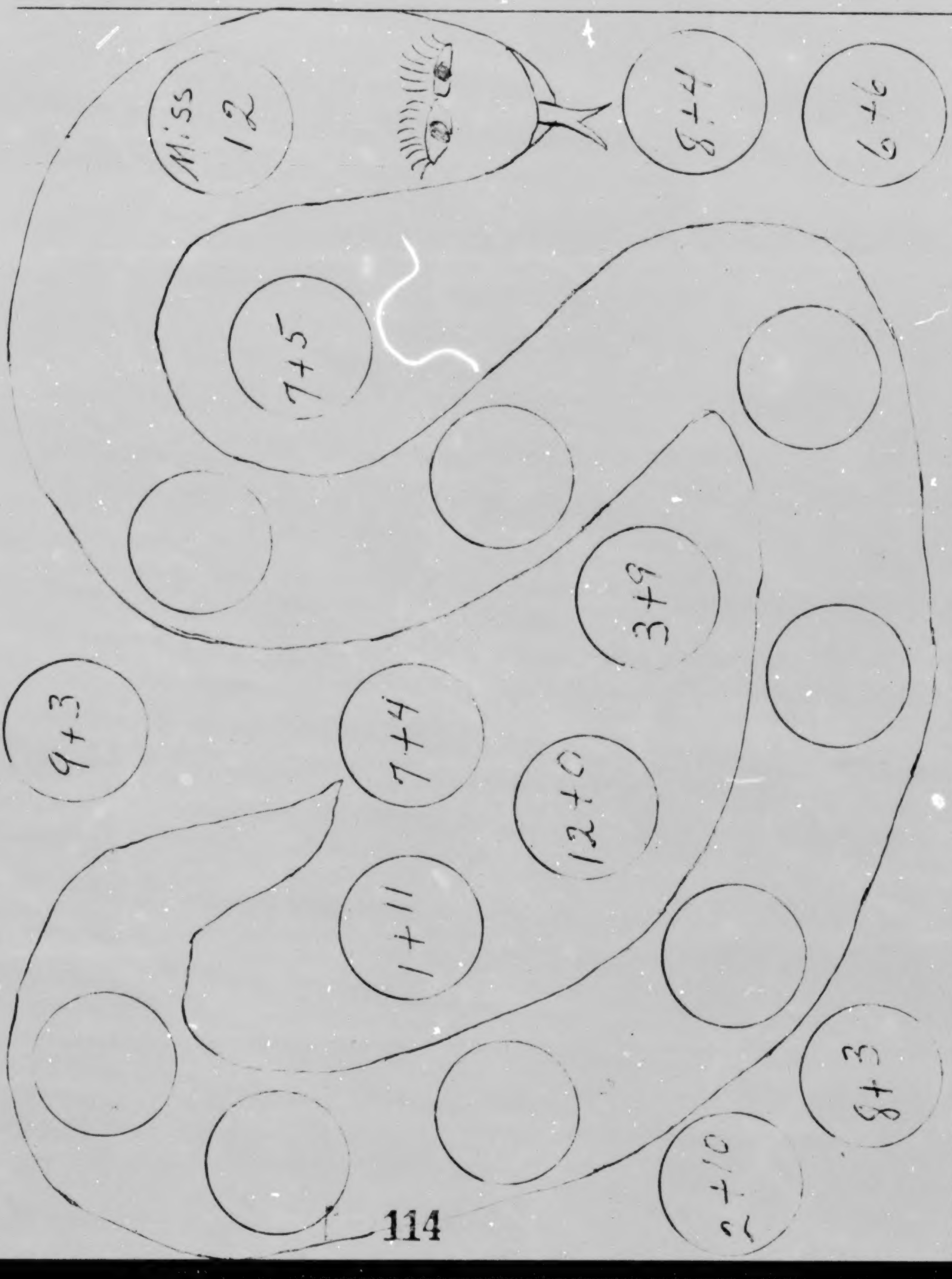
17) 5 + 7 = 12

18) 4 + 7 = 12

Level: 3 Step: A Concept: Addition

Activity C NAME

DIRECTIONS: Cut out the snake. Cut out all circles with the sums of 12 and paste on top of blank circles on the snake.


Miss 12
8+4
6+6
7+5
3+9
9+3
7+4
12+0
1+11
8+3
2+10

Level: 3 Step: A Concept: Subtraction

I. Concept:

Subtraction: Finding the missing addends to twelve.

II. Behavioral Objective:

The student given a sum and one addend both less than 13 will be able to find the missing addend.

III. Mathematical Ideas:

A. Finding the missing addend is an introduction to subtraction.

B. Subtraction is the inverse of addition.

C. Subtraction is renaming a sum and one addend as a missing addend.

IV. Vocabulary to Stress:

missing addend minus subtract

V. Activities:

A. Adapt word problems, number puzzles and games from p. 1-27 and p. 2-19.

* B. Use egg cartons to show missing addends to twelve. For example, have the children put a counter in three sections and then tell how many more they need to make 12. Continue this activity using all the combinations to twelve.

Text References:

Book: 1

Houghton Mifflin (1967)	pp.	281, (51); 282, (52), 287, (53), 288, (54), 289-290, 292-294, 301, 303, 306 (56).
Houghton Mifflin (1972)	pp.	259-260, 262-266, 268-270, 282, 292 (50, 51)

Book: 2

Houghton Mifflin (1967)	pp.	103-106, 109 (15, 16, 17, 18)
Houghton Mifflin (1972)		103-106, 109, 111, 112

Level: 3 Step: A Concept: Subtraction

Text References: (Continued)

Book: 3

Houghton Mifflin (1967) pp. 43 (11, 13)
Houghton Mifflin (1972) pp. 41, (12)
Addison-Wesley (1971, 1968) pp. 20-27

*Suggested Introductory Activity

Level: 3 Step: A Concept: Function

I. Concept:

Function: Introducing picture and bar graphs.

II. Behavioral Objective:

The student given a bar graph can interpret number information.

III. Mathematical Ideas:

A. A graph is a pictorial representation of number information.

IV. Vocabulary to Stress:

graph vertical number line

V. Activities:

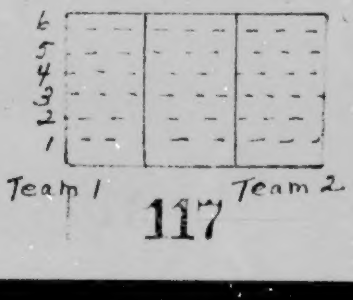
* A. Review the number line for adding and subtracting. Remind the children that you move to the right for addition, and to the left for subtraction. Then draw a vertical number line on the chalkboard. Lead the children to see that they will move up and down on this new number line like a ladder.

* B. Prepare a graph on the chalkboard. Measure small objects in the room, such as an eraser, chalk, pencil, etc. The students may keep a record of the objects they measure. Record the information on the graph.

C. Using rulers, have the children draw a four inch line, a two inch line, and a three inch line and a one inch line. Label these lines A, B, C, and D, and record the lengths on a bar graph.

D. Use example 1 and 2 on page 3-12. Example 1 has the directions. For example 2, ask the children how much does the milk cost? How much does the pencil cost? How much does the sucker cost? and how much does the ice cream cost? Which costs the most? Which costs the least?

E. Prepare a graph on the chalkboard like the one below. Divide the students into two teams. Write a problem on the board. The first team to give the correct answer scores one point. At this time, have the children fill in or extend the appropriate bar on the graph. The first team to score five points wins. This graph could be used in all relays.



Level: 3 Step: A Concept: Function

V. Activities: (Continued)

* F. Make a bulletin board using a large graph showing the 12 months. Have the children help to fill in the graph showing every childs birthday. (Each child could have a square of paper with his name on it to paste on the graph forming the bars.)

Text References:

Book: 1

Houghton Mifflin (1972) pp. 213-218 (41)

Book: 2

Houghton Mifflin (1972) pp. 245-248

Book: 3

Houghton Mifflin (1967) pp. 302-304 (75)
Houghton Mifflin (1972) pp. 118-121 (31)

* Suggested Introductory Activities

Level: 3 Step: A Concept: Function

1) Activity

NAME ____________________

DIRECTIONS:

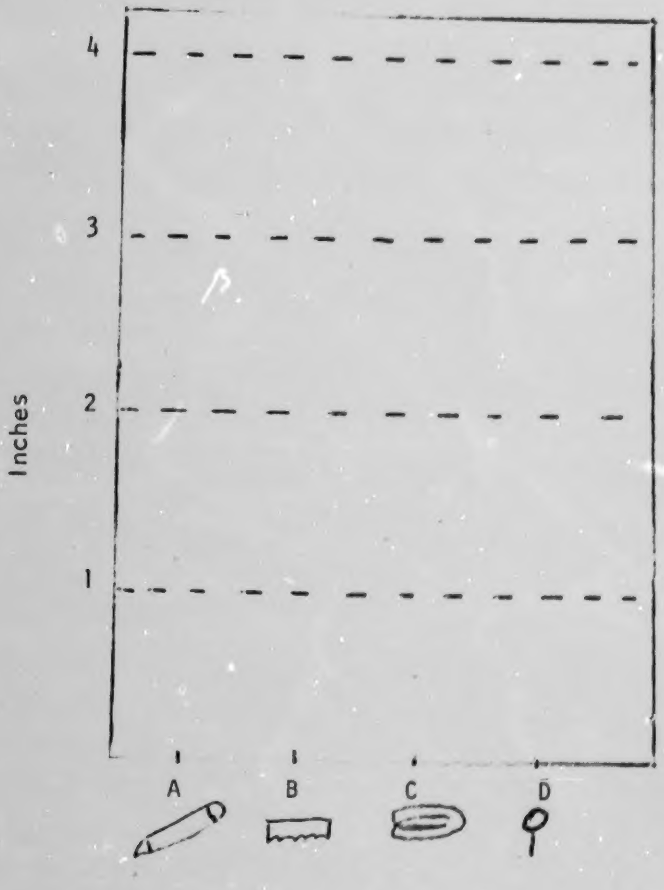
Draw a bar to show that:

A. The pencil is three inches long.

B. The eraser is four inches long.

C. The paper clip is one inch long.

D. The sucker is two inches long.



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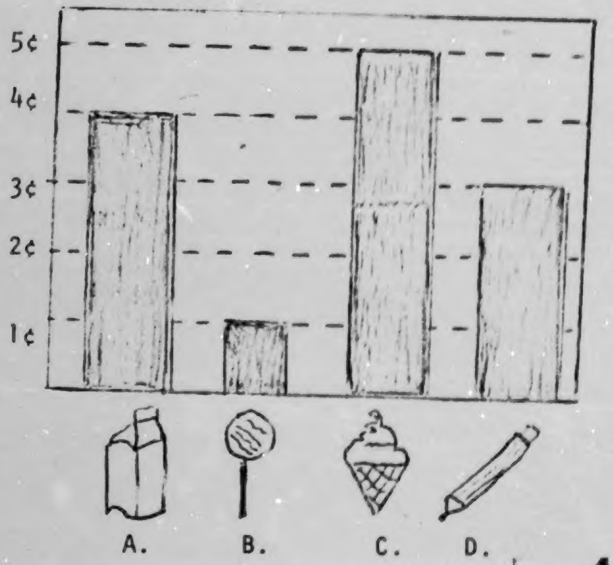
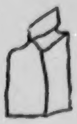
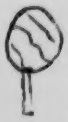
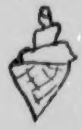
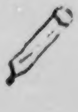


A.  ____________

B.  ____________

C.  ____________

D.  ____________

Level: 3 Step: A Concept: Measurement

I. Concept:

Measurement: Measuring to the nearest inch.

II. Behavioral Objective:

The student given a ruler and a line segment will be able to tell the length of the line segment to the nearest inch.

III. Mathematical Ideas:

A. The measurement of line segments involves a form of comparison.

B. The measurement of an object is the number of standard units contained in that object.

C. One unit of length is the centimeter. It is part of the metric system of units. It is a little shorter than half an inch.

IV. Vocabulary to Stress:

longer shorter same length inch
ruler measure how many

V. Activities:

* A. Introduce the ruler using a plastic ruler on the overhead projector or draw a big ruler on the board. Review how to measure on p. 2-41.

B. Use examples on 3-15 and 3-16.

C. Introduce the centimeter ruler as in Activity C. It is not necessary to compare centimeters to inches. Use the Houghton Mifflin plastic measure.

3-14

Level: 3 Step: A Concept: Measurement

Text References:

Book: 1

Houghton Mifflin (1967) pp. 207-210
Houghton Mifflin (1972) pp. 113-116, 220, 314 (19)
Addison-Wesley (1971, 1968) pp. 282-284

Book: 2

Houghton Mifflin (1967) pp. 71-73

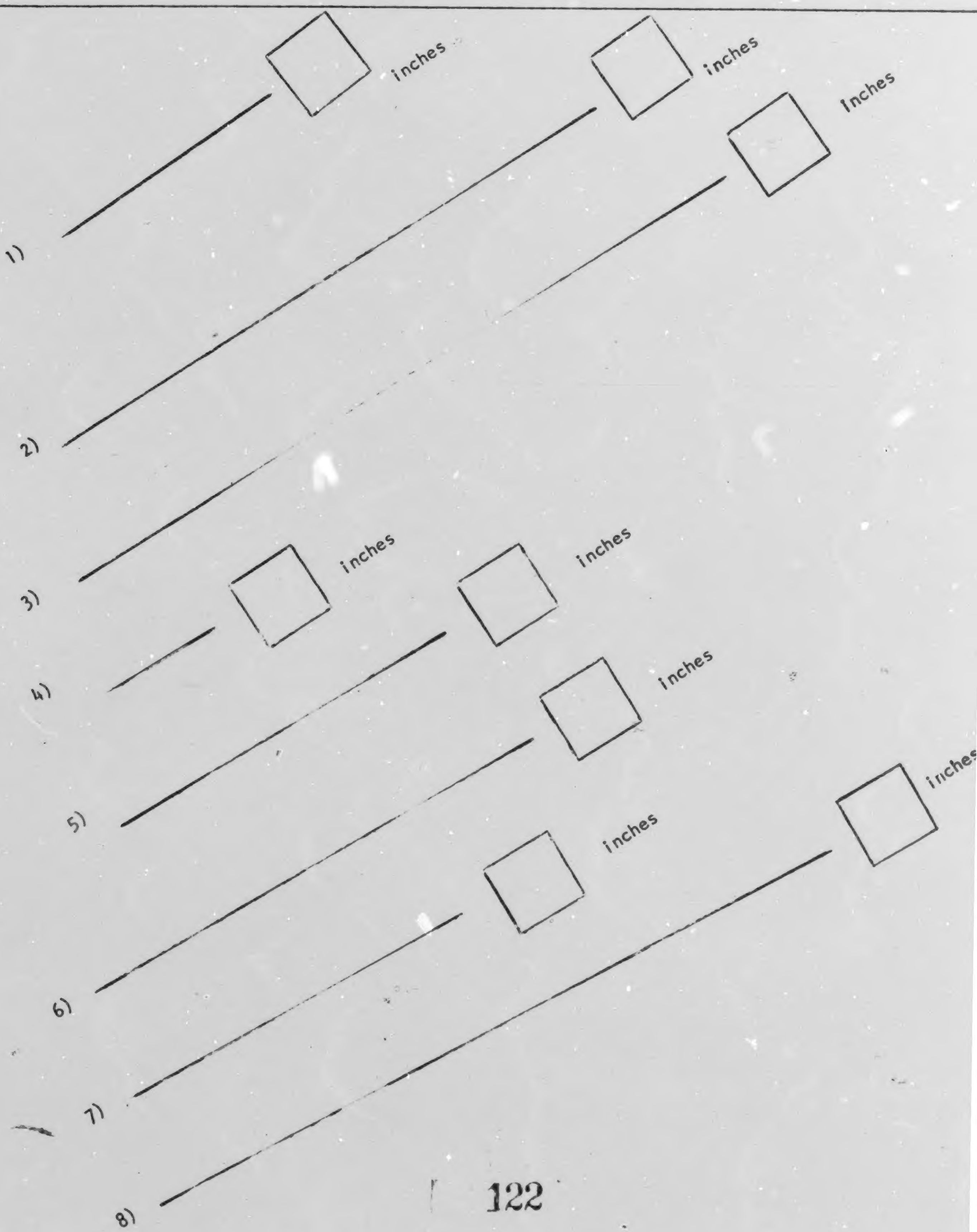
Other References:

Modern Mathematics filmstrip #711 (described on p. 2-41)
Modern Mathematics filmstrip #717 (Phase 1)

* Suggested Introductory Activity

Level: 3 Step: A Concept: Measurement

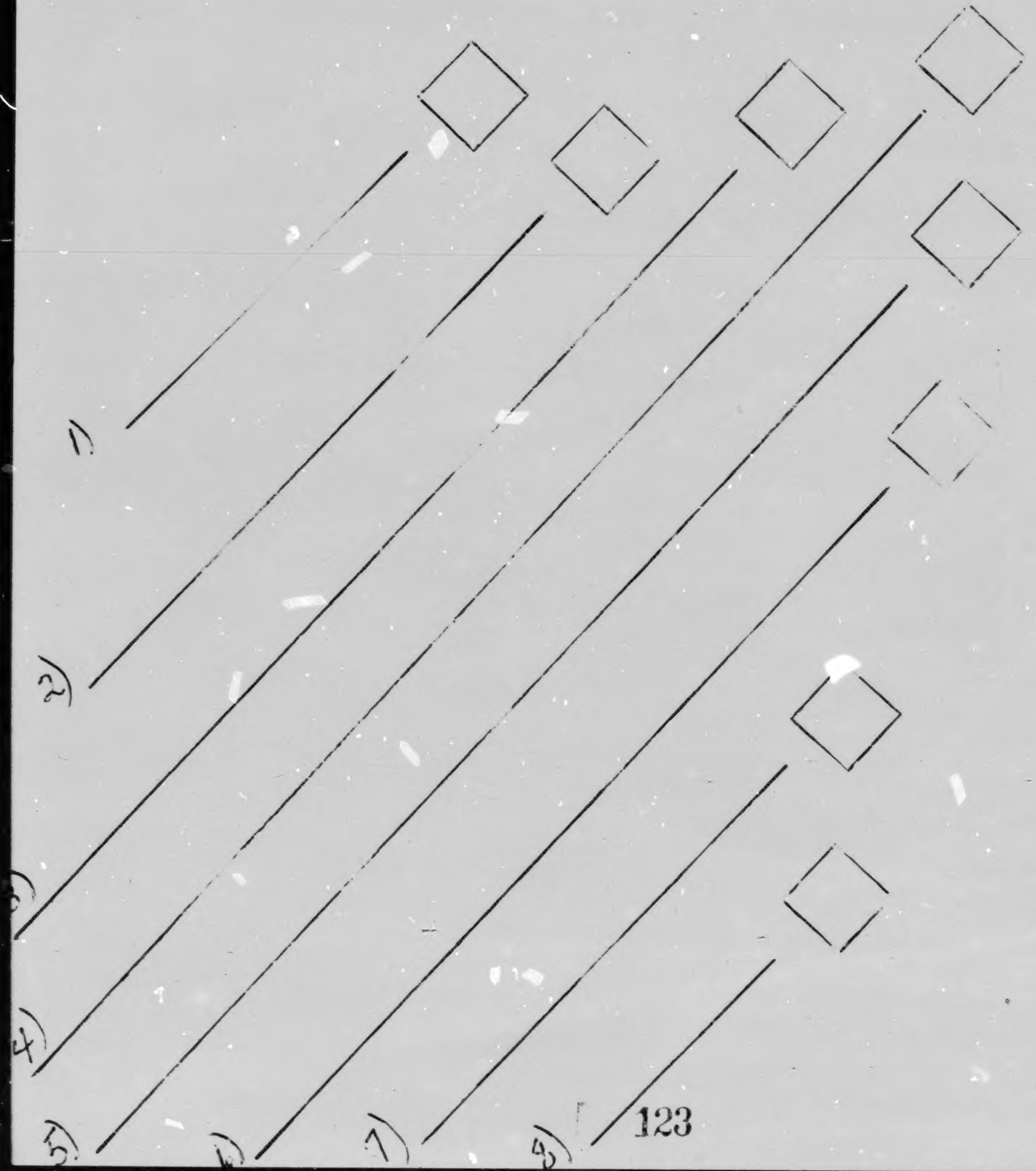
Activity B NAME ______________________________


1) ☐ inches
2) ☐ inches
3) ☐ inches
4) ☐ inches
5) ☐ inches
6) ☐ inches
7) ☐ inches
8) ☐ inches

3-16

Level: 3 Step: A Concept: Measurement

Activity B NAME



Level: 3 Step: B Concept: Numeral

I. Concept:

Numeral: Introducing one-half and one-fourth.

II. Behavioral Objective:

The student given a region will be able to recognize and name $\frac{1}{2}$ and $\frac{1}{4}$ of the region.

III. Mathematical ideas:

A. The symbols $\frac{1}{2}$ and $\frac{1}{4}$ represent fractional numbers.

B. If a region is separated into two parts of the same size, each part is one-half of the region.

C. If a region is separated into four parts of the same size, each part is one-fourth of the region.

D. If a shape is separated into two parts by a line in such a way that the parts are "mirror images" of each other, the shape is said to be symmetrical with respect to the line.

IV. Vocabulary to Stress:

one-half divide fold
one-fourth symmetry

V. Activities:

* A. Make a ditto showing one large circle. Have the children cut out their circles and fold them once keeping the edges even. Then open the circles and color one-half. Discuss the meaning of one-half and write the fraction on the board. Use this activity with squares, rectangles, and triangles. Point out that these shapes are symmetrical.

* B. Demonstrate one-half using an egg carton and yarn, an apple, a piece of string or peas in the pod. Purchase a candy bar for half of your calss. Have each child break his candy bar in half and share with someone who doesn't have one. If the child breaks it unevenly, he must eat the smallest piece.

* C. Use the ditto from Activity A. Have the children cut out the circles and fold them twice. Have them unfold the circle and color one-fourth. Discuss one-fourth and write the fraction on the board. Repeat using squares and rectangles.

Level: 3 Step: B Concept: Numeral

V. Activities: (Continued)

* D. Repeat activity B, adapting for 1/4.

E. Divide a bulletin board into fourths using yarn. Display egg cartons divided into halves and fourths using yarn, and egg cartons cut into halves and fourths. Complete the board using the children's work on circles, triangles, rectangles and squares. On a table under the bulletin board put egg cartons cut into halves and fourths and whole egg cartons and yarn for the children to use.

* F. To introduce "region" give each child a piece of paper. Ask each child to draw the boundary of any shape using a crayon. Have the children exchange papers and color the region (inside) using a different color than the boundary. Have all the children with circles stand. Each child should say, "I have a blue boundary and a red region." Next have the children with triangles do this, etc.

G. Use teacher made dittos. See examples on pages 3-19, 3-20.

H. "Let's Play Games in Mathematics" Vol. 1, games 79, 88.

I. Geoboard cards #11, 12, 13.

J. Let the children use mirror cards to show symmetry.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 113-114, 199--200
Houghton Mifflin (1972) pp. 117, 118, 203-206 (38, 59)

Book: 2

Houghton Mifflin (1967) pp. 235-236
Houghton Mifflin (1972) pp. 223-226

Other References:

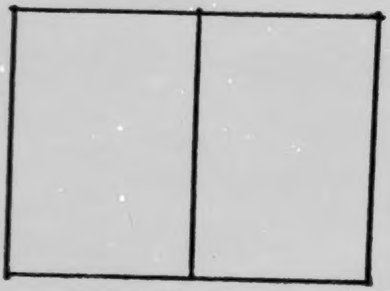
Imperial Tape #19 (Primary)
* Modern Mathematics Filmstrip #718
In this lesson students are introduced to the concept of a fraction. (Use phase one and two only)

* Suggested Introductory Activities

Level: 3 Step: B Concept: Numeral

Activity H NAME________________________

Color $\frac{1}{2}$ of the region and write the fractional numeral $\frac{1}{2}$.



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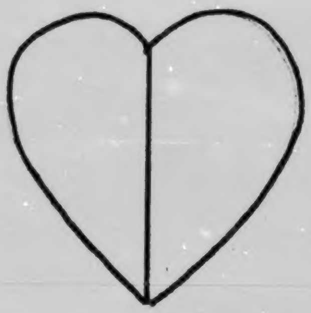

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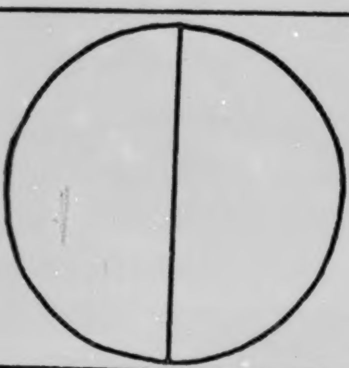

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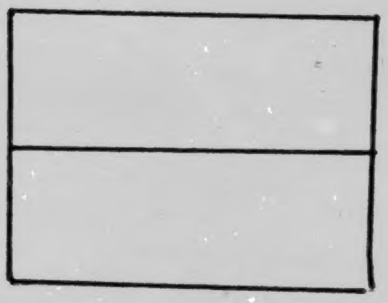

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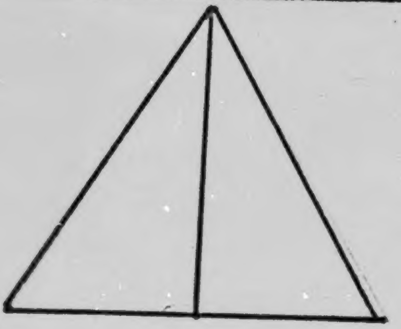

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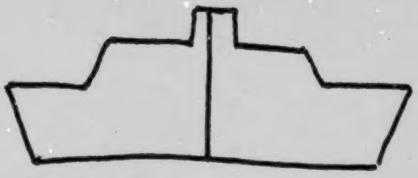

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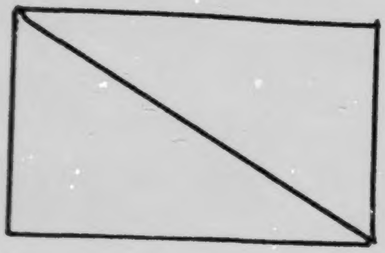

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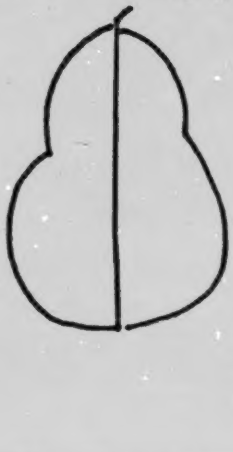

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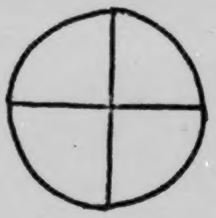
3-20

Level: 3 Step: B Concept: Numeral

Activity H NAME ____________________

Color $\frac{1}{4}$ of the region and write the fractional numeral $\frac{1}{4}$.



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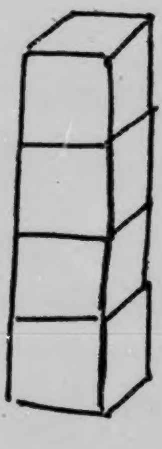

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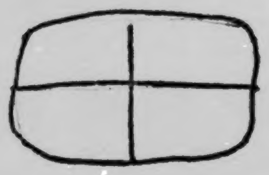

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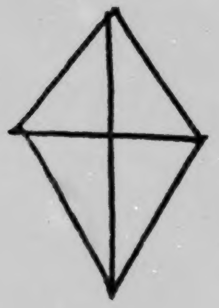

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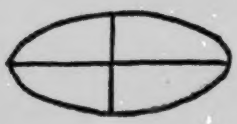

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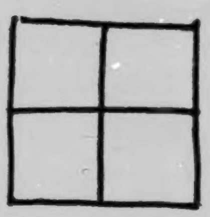

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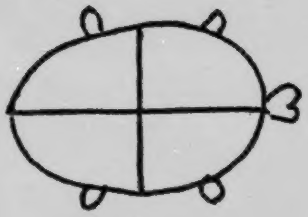

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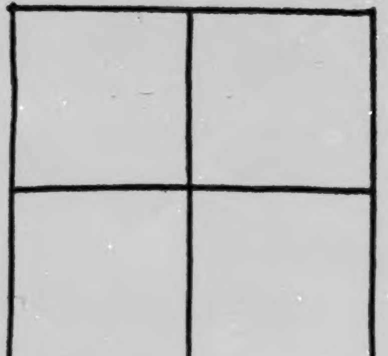


____

Level: 3 Step: B Concept: Addition

I. Concept:

Addition: Using expanded notation.

II. Behavioral Objective:

The student given a two-digit numeral will be able to write it in expanded form.

III. Mathematical Ideas:

Any two digit numeral may be rewritten as a sum. For example, 39 may be renamed as 30 + 9.

IV. Vocabulary to Stress:

tens ones expanded notation

V. Activities:

A. Show 46 on the abacus. The children at the board and at their seats should write 40 + 6 = 46. Repeat many times. (A brief review of 10's would be helpful - example - 4 Tens = 40; then 40 + 6 = 46.)

B. Divide the children into teams. The first person in each team goes to the board. Dictate a two-digit number and the children should write it in expanded form. The team with the first correct answer gets a point. Continue until all have had a turn.

C. Use teacher made dittos. See example on p. 3-22, 3-23, 3-24, 3-36, 3-37.

D. "Let's Play Games in Mathematics" Vol. 1, game 60.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 265, 266, 269, 295, 304
Houghton Mifflin (1972) pp. 255, 275 (43)
Addison-Wesley (1971, 1968) pp. 241, 242

Book: 2

Houghton Mifflin (1967) pp. 95, 96
Houghton Mifflin (1972) pp. 95-98.

Level: 3 Step: B Concept: Addition
Activity C

NAME ____________________

Write the correct numeral in the box.

---

1. 30 + 5 =

2. 90 + 1 =

3. 60 + 7 =

4. 40 + 6 =

5. 10 + 3 =

6. 20 + 8 =

7. 50 + 2 =

8. 80 + 0 =

9. 70 + 4 =

Level: 3 Step: B Concept: Addition

Activity C NAME________________________________

Write the numeral in expanded form.

1) 82 = ☐ + ☐

2) 36 = ☐ + ☐

3) 59 = ☐ + ☐

4) 23 = ☐ + ☐

5) 71 = ☐ + ☐

6) 14 = ☐ + ☐

7) 65 = ☐ + ☐

8) 19 = ☐ + ☐

9) 44 = ☐ + ☐

Level: 3 Step: B Concept: Addition

Activity C NAME ______________________

Write the numeral in expanded form

1) $96 = \square + \square$

2) $64 = \square + \square$

3) $31 = \square + \square$

4) $47 = \square + \square$

5) $22 = \square + \square$

6) $18 = \square + \square$

7) $55 = \square + \square$

8) $73 = \square + \square$

9) $89 = \square + \square$

Write the numeral in the box.

10) $30 + 8 = \square$

11) $20 + 5 = \square$

12) $60 + 1 = \square$

13) $90 + 7 = \square$

14) $10 + 4 = \square$

15) $40 + 3 = \square$

16) $70 + 6 = \square$

17) $30 + 9 = \square$

18) $50 + 0 = \square$

Level: 3 Step: B Concept: Measurement

I. Concept:

Measurement: Telling time to the half hour.

II. Behavioral Objective:

The student given a clock will be able to tell the half hour.

III. Mathematical Ideas:

A. The numerals on a clock form a circular numberline.

B. Measurement of time is indirect and involves the movement of an object from one set place to another.

IV. Vocabulary to Stress:

clock
o'clock
face
hands
half-hour
thirty
time
hour

V. Activities:

A. Use the clocks made in activity B. p. 2-27 or use clocks from Tell Time Quizmo to practice telling time to the half-hour.

B. Using masking tape make a large clock face on the floor or use the circle on the gym floor. Write the numerals on construction paper and tape to the floor. Use two lengths of yarn for the hands. One child sits in the middle and holds the ends of the yarn. Another child holds the other end of the hour hand and the third child holds the other end of the minute hand. The teacher or a child dictates the hour or half-hour and the hands move to form the c correct time.

C. "Relay." Divide the children into teams. Using a clock face show an hour or half-hour to the first member in each team. The first one to tell the correct time gets a point.

D. Use teacher made dittos. See examples on pages 3-27, 3-28.

E. "Let's Play Games in Mathematics", Vol. 1, game 18.

F. Geoboard, Card #7.

G. Tell Time Quizzmo

Level: 3 Step: B Concept: Measurement

Text References:

Book: 1

Houghton Mifflin (1967) pp. 117-118 (19)
Houghton Mifflin (1972) pp. 121-122 (20)
Addison-Wesley (1971, 1968) pp. 198, (53, 54)

Book: 2

Houghton Mifflin (1967) pp. 86, (13)
Houghton Mifflin (1972) p. 84 (13)
Addison-Wesley (1971, 1968) pp. 133-134

Other References:

Modern Mathematics filmstrip #709

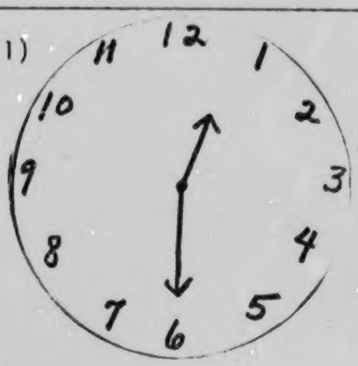
(described on page 2-28)

Level: 3 Step: B Concept: Measurement

Activity D NAME

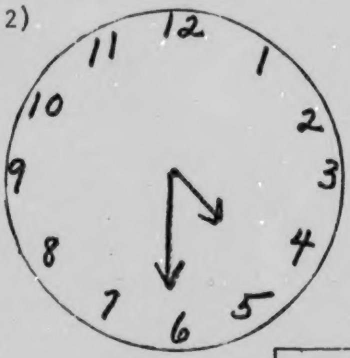
Write the numeral in the box.

1)


12
1
2
3
4
5
6
7
8
9
10
11

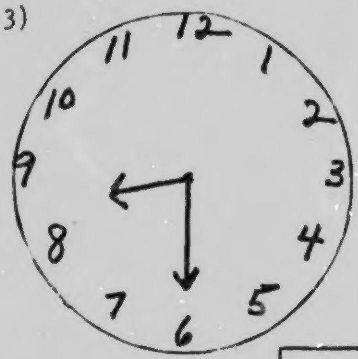
half past

2)


12
1
2
3
4
5
6
7
8
9
10
11

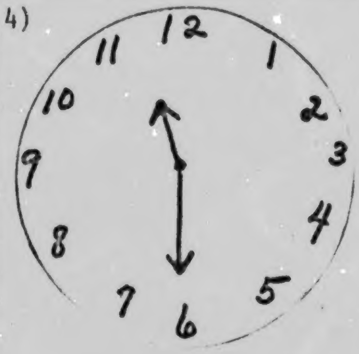
half past

3)


12
1
2
3
4
5
6
7
8
9
10
11

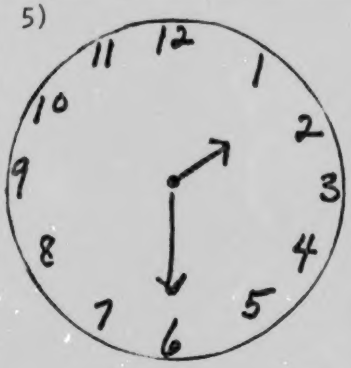
half past

4)


12
1
2
3
4
5
6
7
8
9
10
11

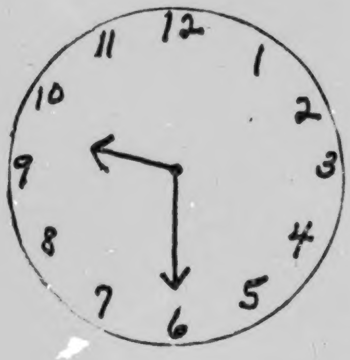
half past

5)


12
1
2
3
4
5
6
7
8
9
10
11

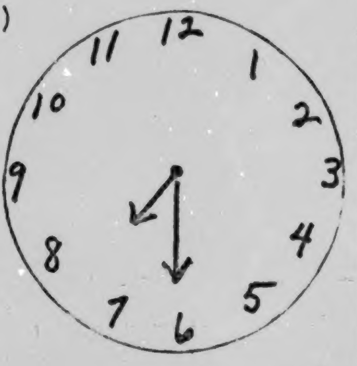
half past

6)


12
1
2
3
4
5
6
7
8
9
10
11

half past

7)


12
1
2
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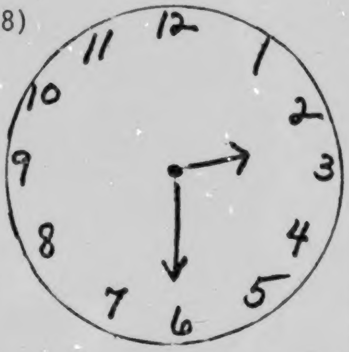
4
5
6
7
8
9
10
11

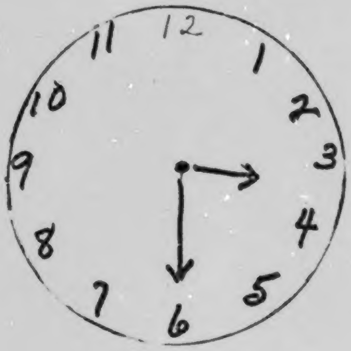
half past

8)


12
1
2
3
4
5
6
7
8
9
10
11

half past

9)


12
1
2
3
4
5
6
7
8
9
10
11

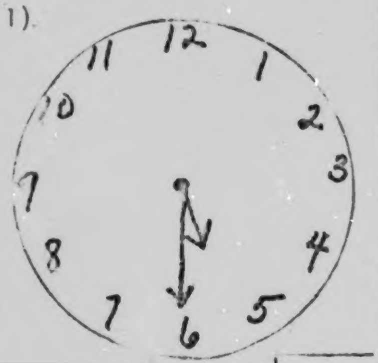
half past

Level: 3 Step: B Concept: Measurement

Activity D NAME ____________________

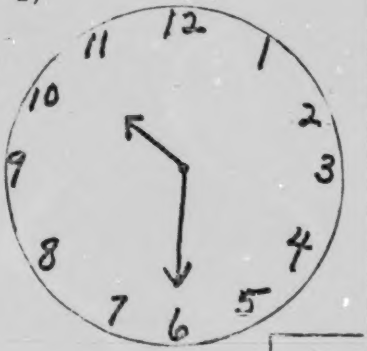
Write the numeral in the box.

1)



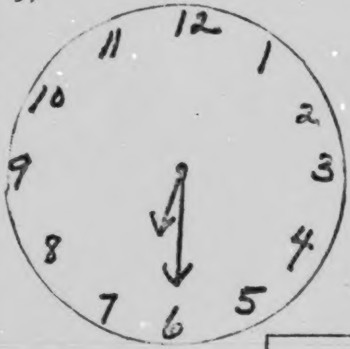
half past ☐

2)



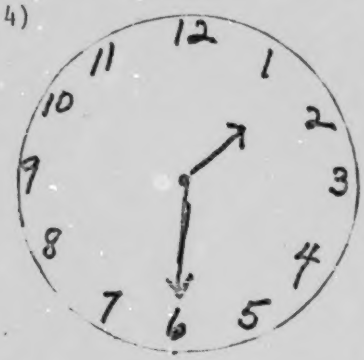
half past ☐

3)



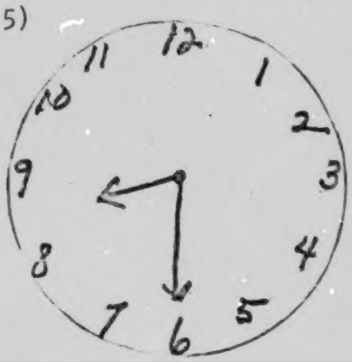
half past ☐

4)



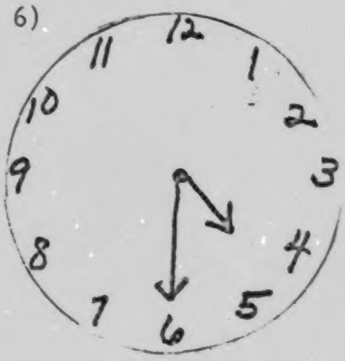
half past ☐

5)



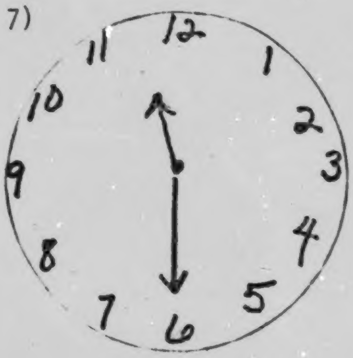
half past ☐

6)



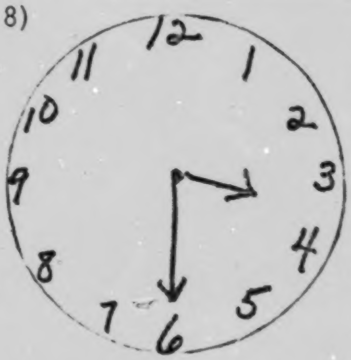
half past ☐

7)



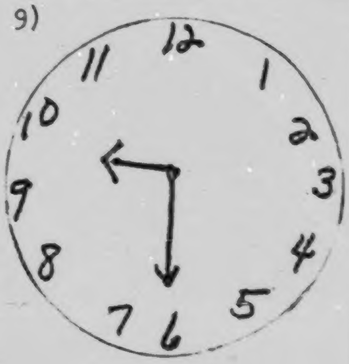
half past ☐

8)



half past ☐

9)



half past ☐

Level: 3 Step: C Concept: Addition

I. Concept:

Addition: Adding two-digit addends using basic facts to nine.

II. Behavioral Objective:

The student given two two-digit addends will be able to name the sum using basic facts to nine.

III. Mathematical Ideas:

A. Addition involves two numbers (binary operation).

B. Addition requires naming a sum.

IV. Vocabulary to Stress:

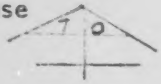
sum addend

V. Activities:

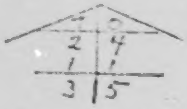
A. Dictate story problems using two two-digit numbers with no renaming.

B. Send a row of children to the chalkboard. Give them a problem such as $\begin{array}{r}42\\+31\\\hline\end{array}$ Have the others do the problems at their desks. By dividing the children into teams, you could use this activity as a relay.

C. "Relay". Divide the children into teams of four. The first person on each team goes to the chalkboard and draws a house



The second person on each team writes the first addend dictated by the teacher. The third person on each team writes the other addend dictated by the teacher. The fourth person writes the sum.



Give a point to each team whose entire problem is correct. For the next relay have the first person go to the end of the team.

D. Use example on page 3-31 and 3-32.

Level: 3 Step: C Concept: Addition

Text References:

Book: 1

Houghton Mifflin (1967) pp. 267-268, (48), 296
Houghton Mifflin (1972) pp. 233-238, 273-274 (46)

Book: 2

Houghton Mifflin (1967) pp. 153-154, 157-164, 167
Houghton Mifflin (1972) pp. 162-168, 171
Addison-Wesley (1971, 1968) pp. 155, 160-164, (44)

Book: 3

Houghton Mifflin (1967) p. 102
Addison-Wesley (1971, 1968) Supp. Ex. set 11

Level: 3 Step: C Concept: Addition

Activity D NAME ____________________

Put the sum in the box.

---

1) 35 +24 ☐

2) 22 +47 ☐

3) 32 +41 ☐

4) 43 +52 ☐

5) 62 +25 ☐

6) 10 +58 ☐

7) 19 +60 ☐

8) 23 +73 ☐

9) 71 +11 ☐

10) 55 +30 ☐

11) 74 +15 ☐

12) 64 +12 ☐

13) 42 +56 ☐

14) 88 +11 ☐

15) 51 +46 ☐

16) 85 +13 ☐

3-32

Level: 3 Step: C Concept: Addition

Activity D NAME____________________

Put the sum in the box.

---

1) $\begin{array}{r} 27 \\ +30 \\ \hline \boxed{} \end{array}$

2) $\begin{array}{r} 15 \\ +63 \\ \hline \boxed{} \end{array}$

3) $\begin{array}{r} 47 \\ +40 \\ \hline \boxed{} \end{array}$

4) $\begin{array}{r} 42 \\ +54 \\ \hline \boxed{} \end{array}$

5) $\begin{array}{r} 34 \\ +33 \\ \hline \boxed{} \end{array}$

6) $\begin{array}{r} 51 \\ +15 \\ \hline \boxed{} \end{array}$

7) $\begin{array}{r} 61 \\ +27 \\ \hline \boxed{} \end{array}$

8) $\begin{array}{r} 56 \\ +23 \\ \hline \boxed{} \end{array}$

9) $\begin{array}{r} 62 \\ +20 \\ \hline \boxed{} \end{array}$

10) $\begin{array}{r} 82 \\ +12 \\ \hline \boxed{} \end{array}$

11) $\begin{array}{r} 73 \\ +20 \\ \hline \boxed{} \end{array}$

12) $\begin{array}{r} 19 \\ +10 \\ \hline \boxed{} \end{array}$

Level: 3 Step: C Concept: Subtraction

I. Concept:

Subtraction: Finding the missing addend using two digit numerals with no renaming.

II. Behavioral Objective:

The student given a two-digit sum and a two-digit addend will be able to name the missing addend with no renaming.

III. Mathematical Ideas:

A. Subtraction is the inverse of addition.

B. Subtraction is renaming a sum and an addend as a missing addend.

IV. Vocabulary to Stress:

addend minus missing addend subtract

V. Activities:

A. Adapt activities from p. 1-27, p. 2-19

Text References:

Book: 1

Houghton Mifflin (1967) pp. 249 (44), 263-264, (47), 270 (49), 271-272, 298-300, (57), (60)
Houghton Mifflin (1972) pp. 253, 256-258, (49), 276 (52)

Book: 2

Houghton Mifflin (1967) pp. 155-156, (37), 176, (39), 183, 184
Houghton Mifflin (1972) pp. 159, 160, 174-176, 183-184 (45)
Addison-Wesley (1971, 1968) pp. 165-176

Book: 3

Houghton Mifflin (1967) pp. 103, 106-109, (29-31)
Houghton Mifflin (1972) pp. 67-69, 71, Extra Practice 323 (19)
Addison-Wesley (1971, 1968) Supp. ex. set 15 (9)

Level: 3 Step: C Concept: Measurement

I. Concept:

Measurement: Measuring to the nearest half-inch.

II. Behavioral Objective:

The student given a ruler and a line segment will be able to tell the length of the line segment to the nearest half-inch.

III. Mathematical Ideas:

A. The measurement of line segments involves a form of comparison.

B. The measurement of an object is the number of standard units contained in that object.

IV. Vocabulary to Stress:

inch	measure	half-inch
how many	ruler	

V. Activities:

* A. Introduce the half-inch using the plastic ruler on the overhead projector or a large ruler drawn on the board.

B. Cut different lengths of construction paper to the nearest half-inch and number them. Give the child an answer sheet numbered the same as the construction paper. Have the child measure the construction paper and write the answer.

C. Use teacher made dittos. See examples on page 3-35, 3-36.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 211-212

Book: 2

Houghton Mifflin (1967) p. 84
Houghton Mifflin (1972) pp. 82, 252

Book: 3

Houghton Mifflin (1967) p. 70
Addison-Wesley (1971, 1968) p. 176

Other References:

Modern Mathematics Filmstrip #723

(Described on page 2-32)

* Suggested Introductory Activity

Level: 3 Step: C Concept: Measurement
Activity C

NAME ____________________

Measure to the nearest one-half inch.

1) ________________________ ☐ inches

2) ______________________________ ☐ inches

3) __________ ☐ inches

4) ____________________________________ ☐ inches

5) __________________ ☐ inches

6) ____ ☐ inches

7) ________________________________ ☐ inches

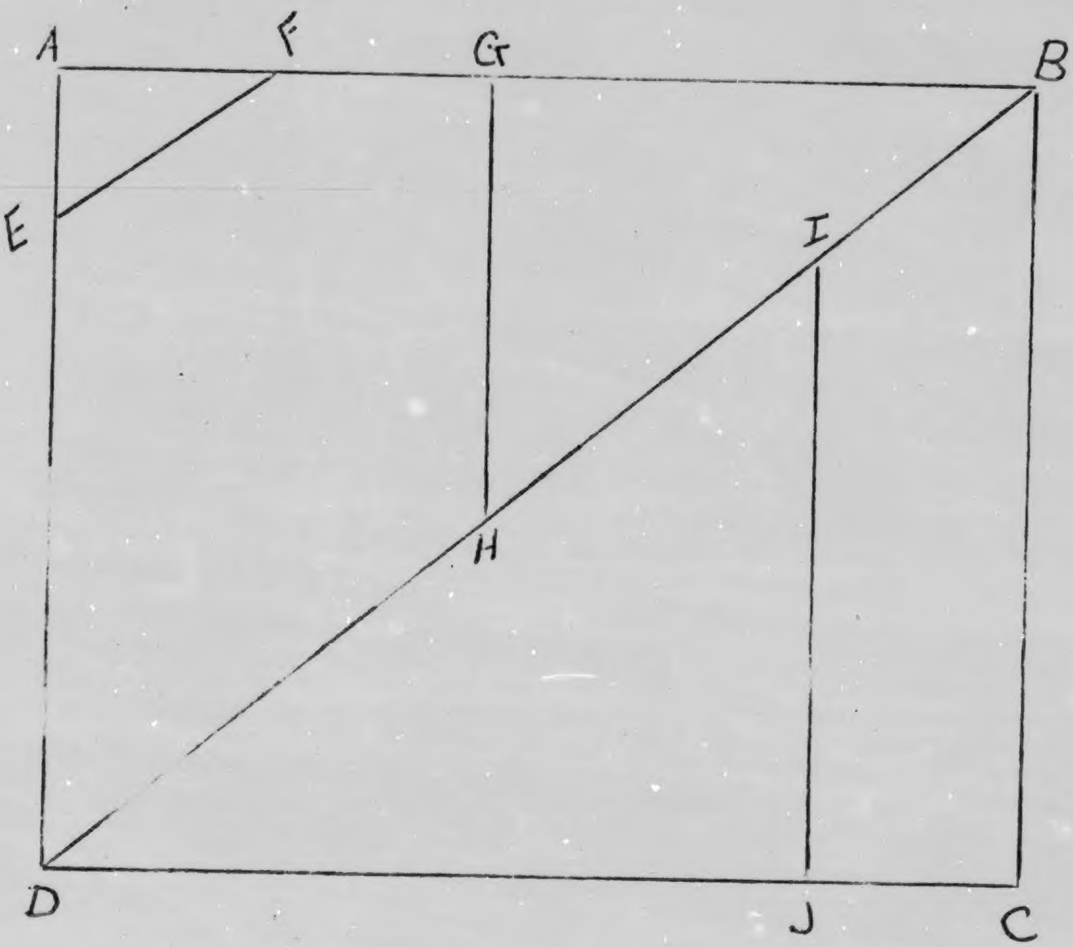
Level: 3
Activity C

Step: C

Concept: Measurement

NAME ____________________

Measure the line segments and write the numeral in the box.



1) AB =

2) BC =

3) DC=

4) EF =

5) GH =

6) IJ =

ANSWERS TO WORKSHEETS

3-2

1) 12
2) 11
3) 11
4) 12
5) 11
6) 12
7) 12
8) 11
9) 11
10) 12
11) 11
12) 12
13) 11
14) 11
15) 12
16) 12
17) 12
18) 12
19) 12
20) 11
21) 11
22) 11
23) 12
24) 12

3-3

1) 12
2) 11
3) 11
4) 11
5) 12
6) 12
7) 11
8) 11
9) 11
10) 12
11) 11
12) 12
13) 12
14) 12
15) 12
16) 11
17) 12
18) 11

3-4

eyes ears nose spots	black
body face	brown

leaves - green

butterflies flowers	orange

3-6

1)
2) X
3) X
4)
5) X
6) X
7) X
8) X
9)
10) X
11)
12) X
13)
14)
15) X
16) X
17)
18) X

3-7

Spots to leave out

7 + 4
8 + 3

3-12

1. A - 3
   B - 4
   C - 1
   D - 2

2. A - 4
   B - 1
   C - 5
   D - 3

3-15

1) 2
2) 5
3) 6
4) 1
5) 3
6) 4
7) 3
8) 6

3-16

1) 3
2) 5
3) 8
4) 10
5) 9
6) 7
7) 4
8) 2

3-22

1) 35
2) 91
3) 67
4) 46
5) 13
6) 28
7) 52
8) 80
9) 74

3-23

1) 80 + 2
2) 30 + 6
3) 50 + 9
4) 20 + 3
5) 70 + 1
6) 10 + 4
7) 60 + 5
8) 10 + 9
9) 40 + 4

3-24

1) 90 + 6
2) 60 + 4
3) 30 + 1
4) 40 + 7
5) 20 + 2
6) 10 + 8
7) 50 + 5
8) 70 + 3
9) 80 + 9
10) 38
11) 25
12) 61
13) 97
14) 14
15) 43
16) 76
17) 39
18) 50

3-27

1) 12
2) 4
3) 8
4) 11
5) 1
6) 9
7) 7
8) 2
9) 3

3-28

1) 5
2) 10
3) 6
4) 1
5) 8
6) 4
7) 11
8) 3
9) 9

ANSWERS TO WORKSHEETS

3-31

1) 59
2) 69
3) 73
4) 95
5) 87
6) 68
7) 79
8) 96
9) 82
10) 85
11) 89
12) 76
13) 98
14) 99
15) 97
16) 98

3-32

1) 59
2) 78
3) 87
4) 96
5) 67
6) 66
7) 88
8) 79
9) 82
10) 94
11) 93
12) 29

3-35

1) $3\frac{1}{2}$
2) $5\frac{1}{2}$
3) $1\frac{1}{2}$
4) 5
5) $2\frac{1}{2}$
6) $6\frac{1}{2}$
7) $4\frac{1}{2}$

3-36

1) $5\frac{1}{2}$
2) $4\frac{1}{2}$
3) $5\frac{1}{2}$
4) $1\frac{1}{2}$
5) $2\frac{1}{2}$
6) $3\frac{1}{2}$

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Answers to Worksheets 4-38

Level: 4 Step: A Concept: Order

I. Concept:

Order: Naming ordinal numbers in an ordered set.

II. Behavioral Objective:

The student given an ordered set will be able to name the ordinal number referring to a specified position.

III. Mathematical Ideas:

A. Ordinal numbers relate to positions in an order.

B. An ordinal number tells which one in a series is being considered.

IV. Vocabulary to Stress:

first	third	fifth	seventh	ninth
second	fourth	sixth	eighth	tenth

V. Activities:

A. Use ordinal words for days of the week and months of the year.

B. Line up ten children who want to be clowns. Ex. Ask the third child to turn a hand spring. Continue with ordinals.

C. Dramatize to show ordinals. Ex. Have ten books on a shelf. Ask child to select the fifth from left to right.

D. Have ten children line up. Choose another child to show you the fourth one and so on.

E. Write the ordinals on tagboard. Give ten children a different card to hold. Another child says, "Would the fourth person please walk around a circle". etc.

F. Give several children different cards with ordinals printed on them. Mark a section of the classroom "Parking Lot". Have the children pretend they are parking mini-bikes in order.

G. Write the ordinal words on tagboard. Mix up cards. Ask a child to put them in order. Ask one child to leave the room. Remove one card. Ask the child to return and find the missing ordinal.

H. Have child fold a piece of newsprint into 8 spaces. Draw circles for clock faces. First write 12, 6, 3, and 9 on each clock in correct place. You indicate time for each clock. Ex. Make the seventh clock show 10:00, etc.

Level: 4 Step: A Concept: Order

V. Activities: (Continued)

* I. Teach the song, "Circus Clowns" from Music Round the Town, p. 64. Choose children as first, second, and third clowns, etc.

J. Have each child draw his hand on a piece of large paper with fingers apart. Give directions such as, "Draw a ring on the fourth finger from the thumb and so forth."

K. Show children a short way of writing first is 1st, second is 2nd, third is 3rd, etc.

L. Correlate ordinals and calendar dates.

M. Cut up cartoon strips which have four or five sections. Children may exchange sets of sections with other students and put them into correct sequence by responding to such questions as, "which is the first picture?", "the second?", etc.

N. Arrange a row of boxes or blocks which may be distinguished by color or some distinctive mark or design. Ask students to name or point out the first, the second, the tenth and so on.

O. "Let's Play Games in Mathematics". Adapt each game to meet the needs of concept to be taught. Volume One: #43, 81, 84, 108. Volume Two: #24, 35, 38, 54, 65, 103. Volume Three: #3, 77.

Text References:

Book: 1

Houghton Mifflin (1972) pp. 307-308 (58)

Book: 2

Houghton Mifflin (1967) pp. 13-14.
Houghton Mifflin (1972) pp. 13-14.

Book: 3

Houghton Mifflin (1967) pp. 12, (4)
Houghton Mifflin (1972) pp. 12 (4), 23

Other References:

Imperial Tapes #39 (Primary)

*Suggested Introductory Activity

Level: 4 **Step: A** **Concept: Order**

WORKSHEET **NAME**____________________

Write the word name for each ordinal number.

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________
9. ____________________
10. ____________________

WORD LIST

second

fifth

ninth

third

tenth

fourth

sixth

eighth

seventh

first

Level: 4 Step: A Concept: Order

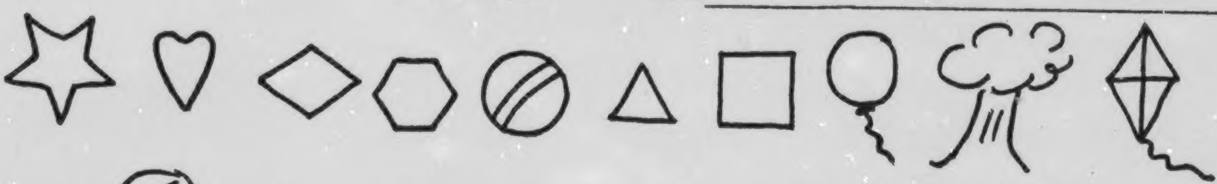
WORKSHEET NAME________________________

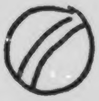
Fill in the proper number name:

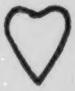
1. John placed ______________(three, third) in the race.
2. Mary was ______________ (ten, tenth) in line.
3. Dick is ______________(eight, eighth) years old.
4. She sat in the ____________(four, fourth) row.
5. He was the _______________(six, sixth) boy to eat an apple.

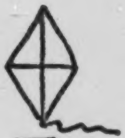
Level: 4 Step: A Concept: Order

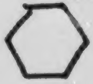
WORKSHEET NAME________________

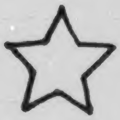


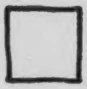
The  is______________in the row.

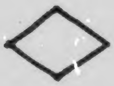
The  is______________in the row.

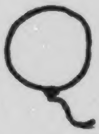
The  is______________in the row.

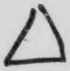
The  is______________in the row.

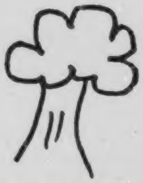
The  is______________in the row.

The  is______________in the row.

The  is______________in the row.

The  is______________in the row.

The  is______________in the row.

The  is______________in the row.

- -

second
tenth
fifth
first
eighth
seventh
ninth
third
fourth
sixth

Level: 4 Step: A Concept: Addition

I. Concept:

Addition: Teaching basic facts with sums 13-15.

II. Behavioral Objective:

The student given two addends will be able to name the sums 13-15.

III. Mathematical Ideas:

A. Addition is the whold number operation that corresponds to the operation of joining disjoint sets.

B. Addition is commutative--the order in which the addends are added does not affect the sum.

C. Thirteen is the compact numeral for 10 + 3.

D. Addition is associative, regroup to form 10.
Example:

$$\begin{aligned} 6 + 7 &= 6 + (4 + 3) \\ &= (6 + 4) + 3 \\ &= 10 + 3 = 13 \end{aligned}$$

Parenthesis are used to indicate grouping.

E. Addition and subtraction are inverse operations.

F. Braces are symbols used to enclose a set whose members are listed or described. Example: {6, 7, 13}.

G. Zero is the identity element for addition.

IV. Vocabulary to Stress:

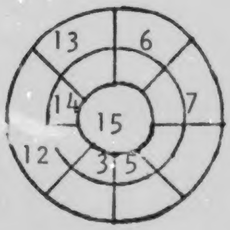
pattern
order
ones
grouping
parenthesis
plus
sets
addends
sum
equation
equals

V. Activities:

A. "Baseball"--Home plate is at the front of the room. First, second and third bases are around the room. The students form two teams. A player from one of the teams acts as pitcher. He "pitches" questions such as, "What is the sum of 8 and 5?" A player from the other side "bats" the answer. If he is correct he goes to first base, if he is wrong he is "out". When three players are "out", the other team "bats" with a new pitcher.

B. "Four Bases"--Four students stand on four bases. The player on the first base names a number less than ten; the player on second base names a number that, added to the first number, gives a total of ten or less; the player on third base names a number that gives a final total of fifteen or less. The player on home base names the sum. Players on the bases are replaced if they make an error.

V. Activities: (Continued)



C. Make a number wheel on the chalkboard. The two outer rings contain addends, the center, the sum. Students name the missing addends.

D. "Tournament"--Two teams, the White Knights and the Black Knights, line up facing each other. Have flash cards for sums of thirteen through fifteen on which a sum or addend is missing. Show the first card to the leaders of each team. The first to answer correctly captures his opponent and directs him to join his team. The team with more members at the end of the game wins.

E. "Check the Address"--You prepare envelopes on which you write a problem, one involving sums fifteen or less, with one number missing is an "address". Inside place a card with the answer. Each student is given an envelope. They read and solve the problem and then check their answer with the card inside. If correct, they may score a point. Envelopes may be exchanged after the problems are completed.

F. "Go Fish"--Children or teacher need to prepare cards for basic facts as, (5, 8, 13). Their cards will look like this:

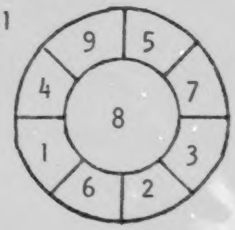
$\boxed{5 + 8 = 13}$ $\boxed{8 + 5 = 13}$ $\boxed{13 - 8 = 5}$ $\boxed{13 - 5 = 8}$

The object of the game is to acquire all four cards. The cards are dealt. The first player may say, "John, do you have $\boxed{5 + 8 = 13}$?" If John has the card he must surrender it; if not, he says, "Go Fish" and takes the next turn. The winner is the player who forms the most families.

G. "Solitaire"--The "Go Fish" cards described in Activity "F" may be used to play "Solitaire". A student deals out twelve of the cards face up. He is required to place another member of the family on any of the upturned cards. He "makes his game" if he uses up all his cards in this way.

H. "Picking Apples"--A paper or card board "apple tree" is placed on the bulletin board. Paper apples with a basic fact on it are fastened on the branches with thumb tacks. The student names the sum or missing addend. If correct, he may keep the apple. If not the apple goes back on the tree. Several students may compete to see who can collect the most apples.

I. "Don't Break the Chain"--Use the practice number wheel by starting with one student and going "around the room", with each student naming the sum of the number in center of wheel and the number you point to in the circle. The challenge is to get around the room without breaking the chain. Adapt by putting other numerals in center of circle.



Level: 4 Step: A Concept: Addition

V. Activities: (Continued)

J. "Drill Down"--Choose two evenly matched teams. Give the first player on one team a combination. If he answers correctly within twenty seconds, continue by giving combination to next player on same team. If his answer is incorrect he sits down and opposing team gets a turn. The team with greatest number of players standing is the winner.

K. "Find the Joker"--Write groups of a family of facts on chalkboard. One fact you write should not belong. Have a child mark the one not belonging. As:

6 + 7 6 + 6 13 - 6 7 + 6 13 - 7

* L. Correlate music and creative writing with mathematics. Try any melody children know or class make their own melody. Sing in rhyme; such as: Six and seven are thirteen, are thirteen, are thirteen; six and seven are thirteen, whenever they are seen.

M. Correlate art with mathematics. "Safe Landing"--Each child will need to make a kite, blimp or parachute with a basic fact written on it. Teacher calls out "Safe landing". Then name a sum between 13 and 18. All children holding basic facts for which that is a sum go to a designated target for a safe landing.

N. Correlate art with mathematics. "Island Hopping"--Draw islands on chalkboard with basic facts on them. Each child makes a helicopter with a sum 13 to 15 on it. He may land his helicopter on the correct island. Children may exchange helicopters for the next game.

O. "Read My Mind"--Tell the group you are thinking of a combination whose sum is, example 15. If a child guesses the combination the teacher is thinking, the child takes the teacher's place. If he misses, another child gets to guess. Can be adapted for teams. The team naming the correct combination with the fewest guesses is the winning team.

P. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught. Volume One: #2, 6, (especially for Halloween), 8, (for any holiday), 13, 14, 35, 84. Volume Two: #2, 4, 15, 21, 23, 35.

Level: 4 Step: A Concept: Addition

Text References:

Book: 1

Houghton Mifflin (1972) pp. 277-280 (53), 285-288 (54, 55)
Addison-Wesley (1971, 1968) pp. 243--245, 247 (57)

Book: 2

Houghton Mifflin (1967) pp. 113-114, (19), 115, (20), 116-117, (21), 120, 122, 124-128, (23), 129-130, (24-25), 132-134, (26-27)
Houghton Mifflin (1972) Addition and Subtraction pp. 113-114,(19-20) 115-116, (21), 120, 122-124, 126-132, (23-25), 134-136, (26-27)
Addison-Wesley (1971, 1968) pp. 81-86, 89, 98-99, 101, 104

Book: 3

Houghton Mifflin (1967) pp. 44, Use Worksheets accompanying Book 2
Houghton Mifflin (1972) pp. 42, Extra practice 319, Use Worksheets accompanying Book 2

Book: 4

Houghton Mifflin (1967) pp. 28, 30, Use Worksheets accompanying Book 2
Houghton Mifflin (1972) pp. 31, 36 Use Worksheets accompanying Book 2
Addison-Wesley (1971, 1968) pp. 22-23, Use Worksheets accompanying Book 2

Other References:

Imperial Tapes #2, 23 (Primary)
Countdown Tape -- Lesson 20, 21

* Suggested Introductory Activity

Level: 4 Step: A Concept: Subtraction

I. Concept:

Subtraction: Finding the missing addend for sums 13-15.

II. Behavioral Objective:

The student given a sum of 15 or less and one addend will be able to name the missing addend.

III. Mathematical Ideas:

A. Subtraction is the inverse of addition.

B. The number operation related to separating sets is called subtraction.

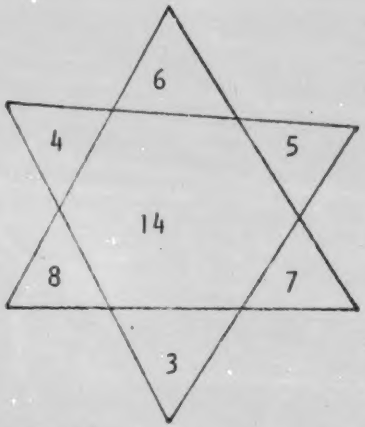
C. Subtraction is the renaming of a sum and an addend as the missing addend.

D. A compact numeral for 10 + 3 is 13.

IV. Vocabulary to Stress: minus sum addends

V. Activities:

A. Draw a star or wheel on the chalkboard. In the center of the star or wheel write a sum between 13-15. The numerals on the points will be one of the addends. The teacher will point to a numeral and ask the child to name the missing addend.



B. "Treasure Hunt"-Cut cardboard in interesting shapes about 3" x 5". Write a numeral less than 10 on each card. You will need several cards with the same numeral. Place the cards around the room, face down. The teacher will write a sum and one addend on the board. Choose a small group to go on the treasure hunt. The teacher will check to see how many found the correct missing addend. The ones with correct answers will be "checkers" for the next game. Children should replace the cards for the next game.

C. "Detective"--Name a child to be chief detective. He will appoint a few children to be deputies. The chief will tell his deputies some addends are missing. Hand out cards similar to those used in "Treasure Hunt". The chief will use a flash card with equation form, one addend missing. The deputies will go about the room searching for correct addends. Those holding correct answers will then be deputies.

Level: 4 Step: A Concept: Subtraction

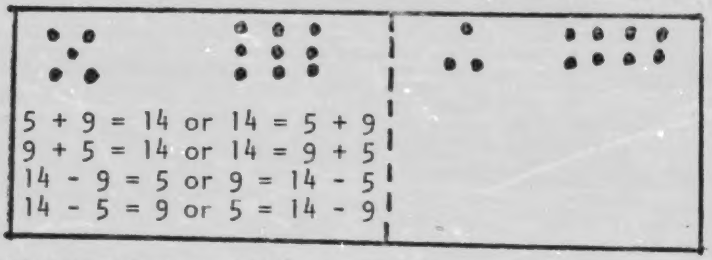
V. Activities: (Continued)

D. "Flash Card Day"--Ask children to be partners. One member of each pair holds the cards and allows the other to answer. Then the other child holds the cards. To score the game, count the number of correct answers given without hesitation. These scores can be recorded on a chart under the date. The record will show each child's progress.

E. "Ladder to the Stars"--Draw ladders on the chalkboard or on ditto. Write combinations on each rung. Top the ladders with red or gold stars, increasing the numbers to correspond with the difficulty of the combinations. Choose a capable child to monitor each ladder and give out gummed stars as they are earned. Assign four children at a time to begin at the bottom of the ladders to give the sums and differences just loud enough for the monitor to hear. Each child who reaches the top, gets the number of stars drawn there.

* F. "Matching Game"--Make addition cards and related subtraction cards. Match the addition and subtraction combinations rather than to find sums and differences. Score a point for each match.

G. "Families"--Each child needs paste and paper (12 x 18 inches), and an envelope containing 40 brightly colored paper disks, 20 of one color and 20 of another. Tell the children to fold their papers into two sections and to decide on a combination between 11 and 18. Ask the children to choose two sets of disks to match the chosen combination and paste these on half of their paper. Then they choose another combination and paste matching sets of disks on the other half of the paper. When that is complete ask them to write the family of addition and subtraction facts to correspond to each set they illustrated.



5 + 9 = 14 or 14 = 5 + 9
9 + 5 = 14 or 14 = 9 + 5
14 - 9 = 5 or 9 = 14 - 5
14 - 5 = 9 or 5 = 14 - 9

H. "Number Riddles"--If you add me to 10, the sum is 16. If you subtract me from 10, the difference is 4. What number am I?

I. "Drill Derby"--Shuffle two sets of combination flash cards, and place them face down in two separate piles on a table. Choose two evenly matched teams. When the play begins, the first member of each team picks up the top flash card, races to the board, and writes the answer to the combination. Score two points for finishing first and being correct, one point for the correct answer. Deduct five points if any team member tells another an answer.

Level: 4 Step: A Concept: Subtraction

V. Activities: (Continued)

J. "Go to Jail"--Mark off a corner of the room as a jail. Have the class form two teams. Write an equation on the board (9 + 3 = 12). Ask a student from one team to write the opposite equation (12 - 9 = 3 or 12 - 3 = 9). If he fails he goes to jail. If he is correct he writes the next equation. One from the other team writes the opposite equation.

K. Adapt Activities Level 4 - Step A - Concept Addition.

L. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught. Volume Two: #35, 71, 84

Text References:

Book: 1

Houghton Mifflin (1972) pp. 277-280 (53), 285-288 (54, 55)
Addison-Wesley (1971, 1968) pp. 243-245, 247 (57)

Book: 2

Houghton Mifflin (1967) pp. 114, (19), 116-117, (20-21), 128, (23), 130, (24-24), 132, (26-27)
Houghton Mifflin (1972) Addition and Subtraction pp. 113-114, (19-20), 116, (21), 129-130, (23-24), 132, (25), 134-136, (26-27)
Addison-Wesley (1971, 1968) pp. 97-101, 103-104, 112, 114, 118, 120-122, 123-124, 126, 128, 130

Book: 3

Houghton Mifflin (1967) pp. 44 Use Worksheets accompanying Book 2
Houghton Mifflin (1972) pp. 42 Use Worksheets accompanying Book 2

Book: 4

Houghton Mifflin (1967) pp. 29, 37 Use Worksheets accompanying Book 2
Houghton Mifflin (1972) pp. 31, 39 Use Worksheets accompanying Book 2
Addison-Wesley (1971, 1968) pp. 24-25 Use Worksheets accompanying Book 2

Other References:

Imperial Tapes #2, 33 (Primary)
Countdown Tape--Lesson 30, 31

* Suggested Introductory Activity

Level: 4 Step: A Concept: Functions and Graphs

I. Concept:

Functions and Graphs: Forming number pairs when the rule involves addition and subtraction.

II. Behavioral Objective:

The student given the rule and a set with at least three number pairs will be able to write the second member of the other number pairs given the first member.

III. Mathematical Ideas:

A. A pair of numbers or objects taken in a particular order is called an ordered pair: "Ordered" because the order or position of the element is very important and "pair" because two elements are involved.

B. An ordered pair is enclosed in parenthesis.

C. Braces are symbols used to enclose a set of ordered pairs.

D. A set of ordered pairs when described by a rule that enables us to find any second member, given the first member, is called a function.

IV. Vocabulary to Stress: rule - number pairs - member - set - braces

V. Activities:

A. "I'll Race You"--Divide the room into two teams. Tell everyone the rule will be " - 5". The first member of each team goes to the chalkboard. You give a number. Example: 8. They write the number you give, write a comma, and write the other member of a number pair. Example: 8, 3. The teacher decides how much time allowed to write this. Next couple to board and so on. The team score calculated on correct answers within time allowed.

Text References:

Book: 2

Houghton Mifflin(1967) pp. 58, 141
Houghton Mifflin(1972) pp. 51, 110, 145,

Book: 3

Houghton Mifflin(1967) pp. 78
Houghton Mifflin(i972) pp. 36

Book: 4

Houghton Mifflin(1972) pp. 34

Level: 4 Step: A Concept: Functions and Graphs

WORKSHEET NAME ______________________

Fill the blanks.

1) +1 (1,2) (2,3) (3,4) (4,___) (5,___)

2) +2 (1,3) (2,4) (3,5) (5,___) (4,___)

3) -1 (2,1) (3,2) (4,3) (5,___) (6,___)

4) -2 (2,0) (3,1) (4,2) (5,___) (6,___)

5) +5 (3,8) (5,10) (7,12) (2,___) (6,___)

6) +3 (3,6) (7,10) (1,4) (5,___) (2,___)

7) -5 (10,5) (8,3) (9,4) (7,___) (5,___)

Level: 4 Step: A Concept: Functions and Graphs

WORKSHEET NAME___________________

Fill in the blanks.

1) -3 {(10, 7) (7, 4) (11, 8) (8, ___) (6, ___)}

2) +2 {(2, 4) (9, 11) (6, 8) (4, ___) (7, ___)}

3) -1 {(8, 7) (6, 5) (2, 1) (7, ___) (5, ___)}

4) -4 {(7, 3) (6, 2) (8, 4) (5, ___) (9, ___)}

5) -2 {(8, 6) (2, 0) (6, 4) (9, ___) (4, ___)}

6) -3 {(15, 12) (9, 6) (11, 8) (7, ___) (4, ___)}

7) +5 {(4, 9) (6, 11) (5, 10) (3, ___) (1, ___)}

Level: 4 Step: A Concept: Functions and Graphs

WORKSHEET NAME____________________

Fill in the blanks.

1) +2 {(3,5) (6,8) (8,10) (4,___) (9,___)}

2) -1 {(8,7) (6,5) (2,1) (7,___) (5,___)}

3) -5 {(12,7) (11,6) (10,5) (9,___) (6,___)}

4) +4 {(1,5) (4,8) (6,10) (3,___) (5,___)}

5) -3 {(10,7) (7,4) (11,8) (8,___) (6,___)}

6) -4 {(7,3) (6,2) (8,4) (5,___) (9,___)}

7) +5 {(4,9) (5,10) (8,13) (6,___) (7,___)}

Level: 4 Step: A Concept: Geometry

I. Concept:

Geometry: Determining a line segment that contains labeled points.

II. Behavioral Objective:

The student given two specific points will be able to draw the line segment.

III. Mathematical Ideas:

A. A line is an infinite set of points.

B. A line segment is the set of points between two named points, the end points.

C. Length is a property of line segments.

IV. Vocabulary to Stress:

end point line line segment measure length

V. Activities:

A. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught. Volume One: #3, 84

Text References:

Book: 2

Houghton Mifflin (1967) pp. 66-68, 73-74
Houghton Mifflin (1972) pp. 61-64
Addison-Wesley (1971, 1968) pp. 291-292

Other References:

Franklin Series, Paper and Pencil Geometry, pp. 26-37.
Franklin Series, Learn to Fold--Fold to Learn, pp. 51-60.
Franklin Series, Learning About Measurement, pp. 5-10.

Modern Mathematics Filmstrip #716

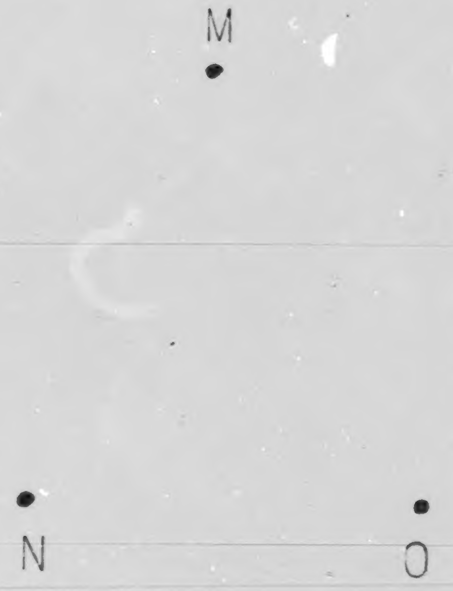
In this lesson students are introduced to some properties of simple geometric figures. This lesson is divided into two phases which may be presented on two consecutive days. (This filmstrip includes properties of a cube which does not apply).

4-18

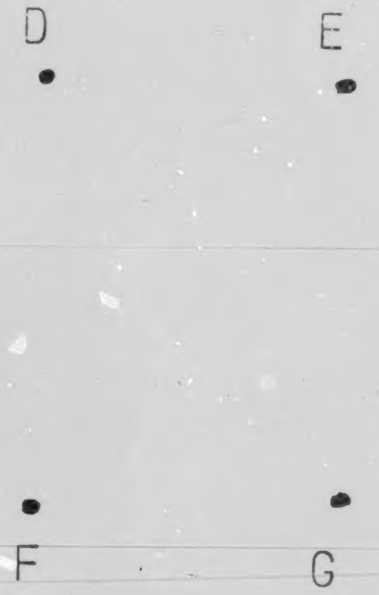
Level: 4 Step: A Concept: Geometry

WORKSHEET NAME____________________

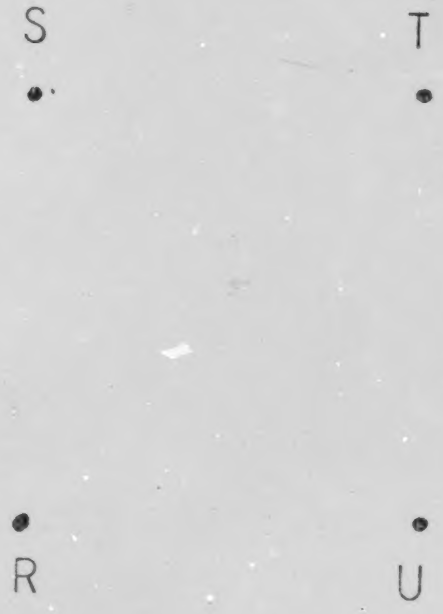
Draw line segment MN.



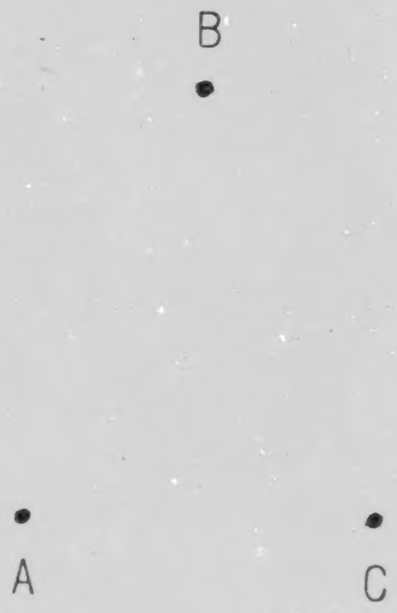
Draw line segment EG.



Draw line segment SR.



Draw line segment BC.



Level: 4 Step: A Concept: Measurement

I. Concept:

Measurement: Counting money to 50 cents.

II. Behavioral Objective:

The student given a set of coins consisting of pennies, nickels, dimes or quarters will be able to name the value of the set not exceeding 50 cents.

III. Mathematical Ideas:

A. Coins have specific values in terms of a basic unit of monetary value.

B. A penny has the value of one cent, a nickel five cents, a dime ten cents, and a quarter twenty-five cents.

C. The combined value of a set of coins is found by adding the value of the members of the set.

IV. Vocabulary to Stress:

coin
penny
nickel
dime
quarter
sum
value
count

V. Activities:

* A. Ask student such questions as:

"How many ways can you make 25¢"? "40¢"?, etc.

B. Let's Play Games in Mathematics: Adapt each game to meet the needs of concept to be taught.

Volume One: #6, 27, 85, 97
Volume Two: #80, 102

Level: 4 Step: A Concept: Measurement

Text References:

Book: 1

Houghton Mifflin (1967) pp. 99-100, 127, 138, 273 (13,40, 50).
Houghton Mifflin (1972) pp. 87-88, (13) 99, 108, 129, 225.
Addison-Wesley (1971, 1968) pp. 33-34, 123, 193, 219, 257, 258, 273-276, (34, 62, 73).

Book: 2

Houghton Mifflin (1967) pp. 185-191.
Houghton Mifflin (1972) pp. 57-58, 189, 191-192, 209.
Addison-Wesley (1971, 1968) pp. 38, 123, 131, 237, 238, 269.

Book: 3

Houghton Mifflin (1967) pp. 15-16.
Houghton Mifflin (1972) p. 9.
Addison-Wesley (1971, 1968) pp. 5, 52, 76.

Other References:

Modern Mathematics Filmstrip #708

Pennies and nickels are dealt with in phase one of this lesson. Dimes are introduced in phase two. Some problems may be solved by counting and others by matching.

*Suggested Introductory Activity

Level: 4 Step: B Concept: Numeral

I. Concept:

Numeral: Reinforcing the principle of place value using a three-digit numeral.

II. Behavioral Objective:

The student given a 3-digit number less than 400 will be able to write it and tell how many hundreds, tens, and ones there are in the numeral.

III. Mathematical Ideas:

A. Our number system uses the base ten.

B. Each numeral has a place value.

IV. Vocabulary to Stress:

hundreds tens ones place value hundred

V. Activities:

A. Dictate a three-digit numeral to a child and have him show the number on the abacus. Repeat many times.

B. Divide the children into two teams and give each team an abacus. Dictate a three-digit numeral to the first person on each team and have them show the number on the abacus. The person with the first correct answer scores a point. Continue until all have had a turn.

C. Send a row of children to the chalkboard while the rest of the children work with pencil and paper. The teacher shows a three-digit numeral on the abacus and all the children write that numeral.

D. "I'm Thinking of a Number."--The teacher says, "I'm thinking of a number that has one hundred, three tens and five ones." Call on a child to give the answer.

E. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught.
Volume Two: #35, 43, 71, 86

Text References:

Book: 1

Houghton Mifflin (1967) pp. 247, 248, 251, 252, 256, 257, 258, 262 (46).
Houghton Mifflin (1972) pp. 223, 227, 239, 243 (48).

Level: 4 Step: B Concept: Numeral

Text References: (Continued)

Book: 2

Houghton Mifflin (1967) pp. 265-266
Houghton Mifflin (1972) pp. 271
Addison-Wesley (1971, 1968) pp. 27-30, (9), (47)

Book: 3

Houghton Mifflin (1967) pp. 20
Houghton Mifflin (1972) pp. 16
Addison-Wesley (1971, 1968) pp. 6, 7, 9

Book: 4

Houghton Mifflin (1967) pp. 13
Houghton Mifflin (1972) pp. 7
Addison-Wesley (1971, 1968) pp. 4-5, Supp. Ex. Set 1

Other References:

Imperial Tapes #14 (Primary)

Level: 4 Step: B Concept: Order

I. Concept:

Order: Counting and ordering 3-digit numerals.

II. Behavioral Objective:

The student given a segment of a number line between 100 and 999 will be able to write the missing numerals.

III. Mathematical Ideas:

A. In our system of numeration, 10 sets of 10 are grouped to form a set of 100.

B. The whole numbers between 100 and 999 are named by a 3-digit numeral.

C. In a 3-digit numeral the digit farthest to the left names the number of hundreds.

D. Our system of numeration is a place-value system. It uses ten digits, each of which has three values: a face value, a place value, and a total value. In 729 7 has the face value of seven, a place value of one hundred, and a total value of seven hundred.

IV. Vocabulary to Stress:

number line | place value chart | face value
3-digit numeral | place value | total value

V. Activities:

A. Have children count by ones in unison starting with 100 or 200 or 300, etc.

B. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught. Volume Two: #35, 54, 71, 76, 82, 84, 103.

Text References:

Book: 1

Houghton Mifflin (1972) pp. 240-242

Book: 2

Houghton Mifflin (1967) pp. 263-264
Houghton Mifflin (1972) pp. 269-270
Addison-Wesley (1971, 1968) pp. 181-184

Book: 3

Houghton Mifflin (1967) pp. 18, 19, 21
Houghton Mifflin (1972) pp. 14, 15
Addison-Wesley (1971, 1968) pp. 8

Book: 4

Houghton Mifflin (1967) pp. 15
Houghton Mifflin (1972) pp. 18

Level: 4 Step: B Concept: Addition and Subtraction

I. Concept:

Addition and Subtraction: Solving word problems involving addition and subtraction with a sum of 15 or less.

II. Behavioral Objective:

The student given a word problem with two addends or an addend and sum less than 15 will be able to determine the operation and solve the problem.

III. Mathematical Ideas:

A. Mathematical thinking involves identifying the sets and distinguishing between joining and separating sets.

B. An equation is a statement about numbers. (The numbers may be associated with sets that are involved in word problems.)

C. Word problems require finding anothername for the cardinal number of the sets in the problem.

IV. Vocabulary to Stress:

equation addends equals plus sum minus

V. Activities:

* A. Teacher reads story problems to class. Children write equations and solve problems.

B. Children make story problems to be solved by class.

C. Tape children's problems. Use in small groups.

D. Let's Play Games in Mathematics: Adapt each game to meet need or concept to be taught.

Volume One: #56
Volume Two: #69, 71

Text References:

Book: 2

Houghton Mifflin (1967) pp. 37, 51-52, 90, 111-112, 121, 123, 131
Houghton Mifflin (1972) pp. 55-56, 76, 111-112, 117, 125, 133
Addison-Wesley (1971, 1968) pp. 55, 67, 111, 113, 115, 119, 129, (34)

Book: 3

Houghton Mifflin (1967) pp. 49
Houghton Mifflin (1972) pp. 46
Addison-Wesley (1971, 1968) pp. 28-29

Level: 4 Step: B Concept: Addition and Subtraction

Text References: (Continued)

Book: 4

Houghton Mifflin (1967)	pp.	43
Houghton Mifflin (1972)	pp.	37
Addison-Wesley (1971, 1968)	pp.	26-27

Other References:

Imperial Tapes #16 (Primary)

*Suggested Introductory Activity

Level: 4 Step: B Concept: Addition and Subtraction

WORKSHEET NAME____________________

Directions: Write the equation and solve the problem.

A. Mr. Horn had 11 horses to sell. He sold 9 of them. Then he had how many horses left to sell?

B. 7 chairs were at the table. Mother put 2 more chairs with them. Then how many chairs were at the table?

C. Patty had 6 toy bears. Father gave her 5 more bears. How many toy bears did Patty have then?

D. 9 blocks were in a box. Nancy put 2 more blocks into the box. Then how many blocks were in the box?

E. Sue made 11 toy clowns to sell. She sold 6 of them. How many toy clowns did Sue have left to sell?

Level: 4 Step: B Concept: Addition & Subtraction

WORKSHEET NAME______________________________

Directions: Write the equation and solve the problem.

A. 3 boxes were in a wagon. Bill put 8 more boxes into the wagon. Then how many boxes were in the wagon?

B. Sue had 12 pennies. She used 3 pennies to buy a piece of candy. How many pennies did Sue have left?

C. 8 shells were on a table. Linda put 4 more shells with them. Then how many shells were on the table?

D. 11 flowers were in the garden. Mrs. Field picked 7 of them. How many flowers were left in the garden?

E. 12 pieces of candy were in a box. John put 8 of the pieces on a plate. How many pieces of candy did he leave in the box?

Level: 4 Step: B Concept: Addition and Subtraction

WORKSHEET NAME____________________

Directions: Write the equation and solve the problem.

A. Pete had 10 stones at home. He took 6 of them to school. How many stones did Pete leave at home?

B. 11 plates were on a shelf. Jane took 8 of them away. How many plates were left on the shelf?

C. Linda had 7 bells. She bought 4 more. How many bells did Linda have then?

D. John had 10 quarters. He used 3 of them to buy a toy car. How many quarters did John have left?

E. Mr. Green had 6 birds. He bought 4 more birds. How many birds did Mr. Green have then?

Level: 4 Step: B Concept: Addition and Subtraction

WORKSHEET NAME

Directions: Write the equation and solve the problem.

A. 9 pieces of chicken were on a plate. Mrs. Bell put 3 more pieces with them. Then how many pieces of chicken were on the plate?

B. 5 toy firemen were on a shelf. Bob put 6 more on the shelf. Then how many firemen were on the shelf?

C. 12 flowers were in a basket. Patty took 4 flowers out of the basket. How many flowers were left in the basket?

D. Mr. Brown had 5 pigs. He bought 7 more pigs. Then Mr. Brown had how many pigs?

E. 11 birds were in the garden. 3 of the birds flew away. Then how many birds were in the garden?

Level: 4 Step: B Concept: Functions and Graphs

I. Concept:

Functions and Graphs: Determining the rule from number pairs involving addition or subtraction.

II. Behavioral Objective:

The student given a set with at least three number pairs will be able to name an addition or subtraction rule.

III. Mathematical Ideas:

A. A set of ordered number pairs, together with a rule for determining the second member from the first, is called a function.

IV. Vocabulary to Stress: number pair - member - set - braces - rule.

V. Activities:

A. "What's My Rule?"--Ask a student to write a number on the chalkboard. Then you write a number (after a comma) that is three greater. Another student write another number under the first number. Again you write a number three greater than the last number written. Repeat this until you have several pairs. Then ask who can tell how you arrived at the second number in each pair.

Text References:

Book: 2

Houghton Mifflin(1967) pp. 110

Book: 3

Houghton Mifflin(1967) pp. 78, 95, 97, 99, 104
Houghton Mifflin(1972) pp. 37, 45, 51, 53, 63, 65, 79, Extra Practice 322
Addison-Wesley(1971, 1968) pp. 39-41, 259

Book: 4

Houghton Mifflin(1967) pp. 41
Houghton Mifflin(1972) pp. 35
Addison-Wesley (1971, 1968) pp. 29, 45

Level: 4 Step: B Concept: Functions and Graphs

WORKSHEET NAME____________________

Name the rule and find the missing numbers.

A) ____	B) ____	C) ____	D) ____	E) ____
1) 4, 9	1) 12, 10	1) 1, 4	1) 9, 13	1) 15, 12
2) 6, 11	2) 10, 8	2) 5, 8	2) 6, 10	2) 9, 6
3) 5, 10	3) 4, 2	3) 3, 6	3) 5, 9	3) 11, 8
4) 3, ___	4) 7, ___	4) 9, ___	4) 2, ___	4) 8, ___
5) 8, ___	5) 2, ___	5) 4, ___	5) 7, ___	5) 7, ___
6) 1, ___	6) 9, ___	6) 7, ___	6) 3, ___	6) 15, ___
7) 7, ___	7) 13, ___	7) 2, ___	7) 4, ___	7) 4, ___
8) 2, ___	8) 3, ___	8) 8, ___	8) 11, ___	8) 7, ___
	9) 5, ___	9) 6, ___	9) 10, ___	9) 3, ___

F) ____ {(8, 7) (6, 5) (2, 1) (7, __) (5, __) (3, __)}

G) ____ {(12, 14) (10, 12) (5, 7) (16, __) (9, __) (8, __)}

H) ____ {(12, 6) (6, 0) (10, 4) (7, __) (15, __) (9, __)}

I) ____ {(9, 15) (6, 12) (0, 6) (2, __) (3, __) (5, __)}

Level: 4 Step: B Concept: Measurement

I. Concept:

Measurement: Introducing the cup, pint, and quart as standard units of liquid measure.

II. Behavioral Objective:

The student given a measure expressed in cups, pints, or quarts and a table of measures will be able to name the equivalent measure in either of the other liquid measures.

III. Mathematical Ideas:

A. Cups, pints, quarts are standard units of liquid measure.

B. One pint is equivalent to two cups. One quart matches two pints. This is an example of one-to-many matching.

IV. Vocabulary to Stress: cup pint quart liquid measure

V. Activities:

A. Take two sheets of paper. Place them together and fold once or twice. Cut across the fold to make pairs of symmetrical shapes. Cut one shape of each pair in half, and hand all three pieces of paper to a student. The students should see that the cut pieces can be fitted together to make the complete shape. This is an example of one-to-two matching. Vary the activity by mixing up various shapes and having the students sort out pairs to match a whole. Continue until they have grasped the idea of one-to-two matching.

B. Have a large container with water in it. (It is more interesting if the water has a few drops of food coloring in it.) Ask one child to fill a quart measure then pour it into as many pints as it will make. Ask another child to fill a pint measure and pour that amount into cups. Pour one cup into a pint. Ask how much more the pint needs to fill it.

C. Ask two children to work together. Write questions on chalkboard as: Which is more: one quart or three cups? Will a quart fill three pint measures? Will a pint fill two cups? Children named will measure then write answers on board.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 110-112 (18)
Houghton Mifflin (1972) pp. 210-212 (40)

Book: 2

Houghton Mifflin (1967) pp. 87-88, (14)
Houghton Mifflin (1972) pp. 86, 88, (14), 237-238
Addison-Wesley (1971, 1968) pp. 286

Level: 4 Step: B Concept: Measurement

Text References: (Continued)

Book: 3 and 4 (Pages in the third and fourth grade books include half gallon and gallon)

Other References:

Imperial Tapes #13 (Primary)

Franklin Series, Learning About Measurement, pp. 60-65.

Modern Mathematics Filmstrip #717

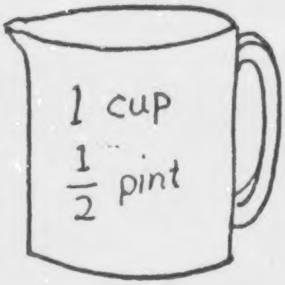
This lesson is divided into two phases, Linear and Liquid Measure. Phase two can be used with advanced.

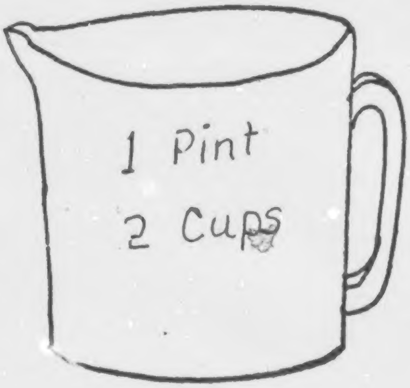
4-34

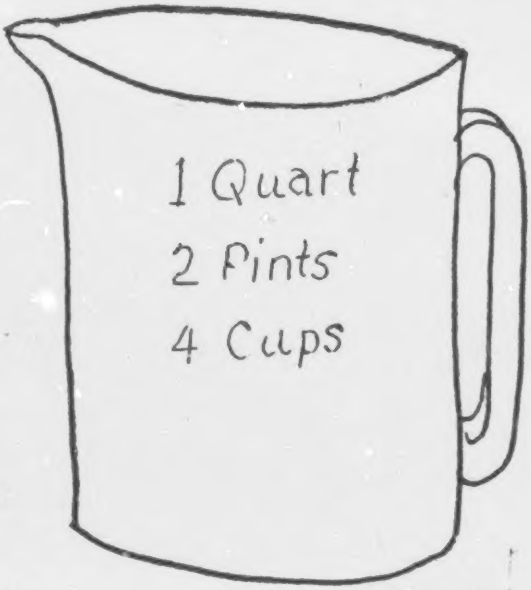
Level: 4 Step: B Concept: Measurement

WORKSHEET NAME____________________

Write equivalent measurements.


1 cup
$\frac{1}{2}$ pint


1 Pint
2 Cups


1 Quart
2 Pints
4 Cups

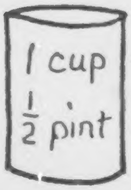
1 pint	___cup(s)
4 cups	___quart(s)
2 quarts	___pint(s)
2 cups	___pint(s)
2 pints	___quart(s)
1 quart	___cup(s)
4 pints	___quart(s)
2 pints	___cup(s)

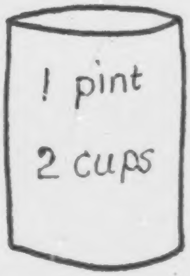
Level: 4 Step: B Concept: Measurement

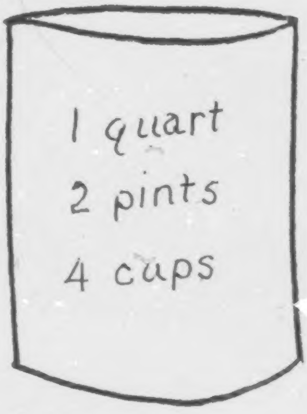
WORKSHEET: NAME ____________________

Which is More? Circle it.

1. I cup or I pint.
2. 3 cups or I quart.
3. 3 cups or I pint.
4. 5 cups or I quart.
5. I pint or I quart.
6. 3 pints or I quart.
7. I pint or 4 cups.
8. 2 pints or 3 cups.
9. 3 pints or 2 cups.
10. I quart or 3 cups.


1 cup
$\frac{1}{2}$ pint


1 pint
2 cups


1 quart
2 pints
4 cups

Level: 4 Step: B Concept: Measurement

WORKSHEET NAME______________________________

DIRECTIONS: Use the chart to fill in the blanks.

Quart			
Pint		Pint	
Cup	Cup	Cup	Cup

2 cups make ______________ pint (s)

4 cups make ______________ quart (s)

2 pints make ______________ quart (s)

2 pints make ______________ cup (s)

1 quart makes ______________ pint (s)

4 pints make ______________ cup (s)

1 pint makes ______________ cup (s)

2 quarts make ______________ pint (s)

4 cups make ______________ pint (s)

1 quart makes ______________ cup (s)

Level: 4 Step: B Concept: Measurement

WORKSHEET: NAME ______________________

DIRECTIONS: USE THE CHART TO FILL IN THE BLANKS.

QUART			
PINT		PINT	
CUP	CUP	CUP	CUP

4 cups make __________ quart(s).

2 pints make __________ cup(s).

4 pints make __________ cup(s).

2 quarts make __________ pint(s).

1 quart makes __________ cup(s).

2 cups make __________ pint(s).

2 pints make __________ quart(s).

1 quart makes __________ pint(s).

1 pint makes __________ cup(s).

4 cups make __________ pint(s).

ANSWERS TO WORKSHEETS

Step A

4-3

1. first
2. second
3. third
4. fourth
5. fifth
6. sixth
7. seventh
8. eighth
9. ninth
10. tenth

4-4

1. third
2. tenth
3. eight
4. fourth
5. sixth

4-5

fifth
second
tenth
fourth
first
seventh
third
eighth
sixth
ninth

4-14

1) 5, 6
2) 7, 6
3) 4, 5
4) 3, 4
5) 7, 11
6) 8, 5
7) 2, 0

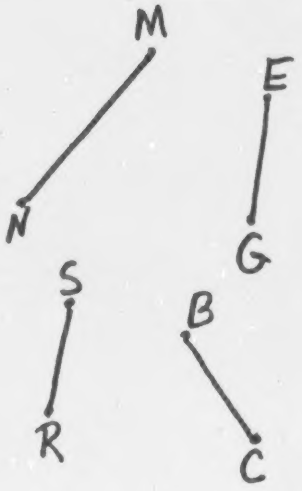
4-15

1) 5, 3
2) 6, 9
3) 6, 4
4) 1, 5
5) 7, 2
6) 4, 1
7) 8, 6

4-16

1) 6, 11
2) 6, 4
3) 4, 1
4) 7, 9
5) 5, 3
6) 1, 5
7) 11, 12

4-18



Step B

4-26

A. 11 - 9 = 2
B. 7 + 2 = 9
C. 6 + 5 = 11
D. 9 + 2 = 11
E. 11 - 6 = 5

4-27

A. 3 + 8 = 11
B. 12 - 3 = 9
C. 8 + 4 = 12
D. 11 - 7 = 4
E. 12 - 8 = 4

4-28

A. 10 - 6 = 4
B. 11 - 8 = 3
C. 7 + 4 = 11
D. 10 - 3 = 7
E. 6 + 4 = 10

4-29

A. 9 + 3 = 12
B. 5 + 6 = 11
C. 12 - 4 = 8
D. 5 + 7 = 12
E. 11 - 3 = 8

4-31

A) +5
4) 8
5) 13
6) 6
7) 12
8) 7

B) -2
4) 5
5) 0
6) 7
7) 11
8) 1
9) 3

C) +3
4) 12
5) 7
6) 10
7) 5
8) 11
9) 9

D) +4
4) 6
5) 11
6) 7
7) 8
8) 15
9) 14

E) -3
4) 5
5) 4
6) 12
7) 1
8) 4
9) 0

F) -1, 6, 4, 2
G) +2, 18, 11, 10
H) -6, 1, 9, 3
I) +6, 8,9, 11

ANSWERS TO WORKSHEETS

Step B (Continued)

4-34

2 cups
1 quart
4 pints
1 pint
1 quart
4 cups
2 quarts
4 cups

4-35

1. 1 pint
2. 1 quart
3. 3 cups
4. 5 cups
5. 1 quart
6. 3 pints
7. 4 cups
8. 2 pints
9. 3 pints
10. 1 quart

4-36

1 pint
1 quart
1 quart
4 cups
2 pints
2 quarts
2 cups
4 pints
2 pints
4 cups

4-37

1 quart
4 cups
8 cups
4 pints
4 cups
1 pint
1 quart
2 pints
2 cups
2 pints

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Level: 5 Step: A Concept: Numeral

I. Concept:

Numeral: Extending place value to 999.

II. Behavioral Objective:

The student given any three-digit numeral will be able to read, write, and identify the place value of each digit.

III. Mathematical Ideas:

A. Ten is the base of our number system.

B. The value of a digit has ten times the value of the same digit to the right.

C. A numeral such as 429 has three-digits. Each of these digits has three meanings: (1) face value, (2) place value, (3) total value. The 4 in 429 has the face value of four, place value of hundred, and the total value of four hundred.

D. Expanded notation can be used to express the total value of each digit. 400 + 20 + 9 = 429.

IV. Vocabulary to Stress:

digit
place value
ones' place
tens' place
hundreds' place

V. Activities:

A. Children use abacus to read ones, tens, hundreds.

B. Each child draws his house and writes a three-digit numeral between 400 and 900 on it. Children can practice reading house numbers. Arrange according to order from smallest to largest.

C. Fold paper airplanes. Child uses his own initials and a three-digit numeral greater than 400 to identify his plane. Ex. "C.H. 507." Read to classmates.

D. "Who Am I?". Teacher says, "I am 4 hundreds, 2 tens and 6 ones. Who am I?" Call on child and have him write it on the board. He is "It" for the next game.

E. "Detective". All detectives be on the look-out for missing number. His hundreds' place is 9, his tens' place is 7, and his ones' place is the number one more than 4. Call on a child and the teacher may write the answer on the overhead projector.

Level: 5 Step: A Concept: Numeral

V. Activities: continued

F. "Robbery at the Super Market". Attention all squad cars. Recover from robber 5 one hundred dollar bills, 5 ten dollar bills, and 1 five dollar bill. How much money is missing?

G. "Using hundreds', tens', and ones'". Cut 30 squares of tagboard. On each card put one number from 0 to 9. Divide into 3 sets making 3 cards of each number. Write ones at the bottom under each number of one set. Write tens on the second set of cards and hundreds on the third set. Give one card each to 30 children. Those without cards take turns calling numbers as 562. Children holding cards 5 hundreds, 7 tens, and 2 ones come in front of the class and stand in order to form the number called.

H. "I've Met You". Give each child in the room a card with a number from 400 to 999 written on it. You ask for the one holding the number which comes before 588 to stand and the one holding the number which comes after 588 to stand.

I. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught. Volume II: #35, 38, 54, 71, 82, 84, 86, 103.

Text References:

Book: 1

Houghton Mifflin(1972) pp. 239, 243-246

Book: 2

Houghton Mifflin(1967) pp. 263-264
Houghton Mifflin(1972) pp. 272.
Addison-Wesley (1971, 1968) 27-30, (9), 179-180, (47), 181-184.

Book: 3

Houghton Mifflin(1967) pp. 20, (7)
Houghton Mifflin(1972) pp. 16
Addison-Wesley (197, 1968) pp. 6-7

Book: 4

Houghton Mifflin(1967) pp. 12-13
Houghton Mifflin(1972) pp. 6-7, (2)
Addison-Wesley (1971, 1968) pp. 4-5

Book: 5

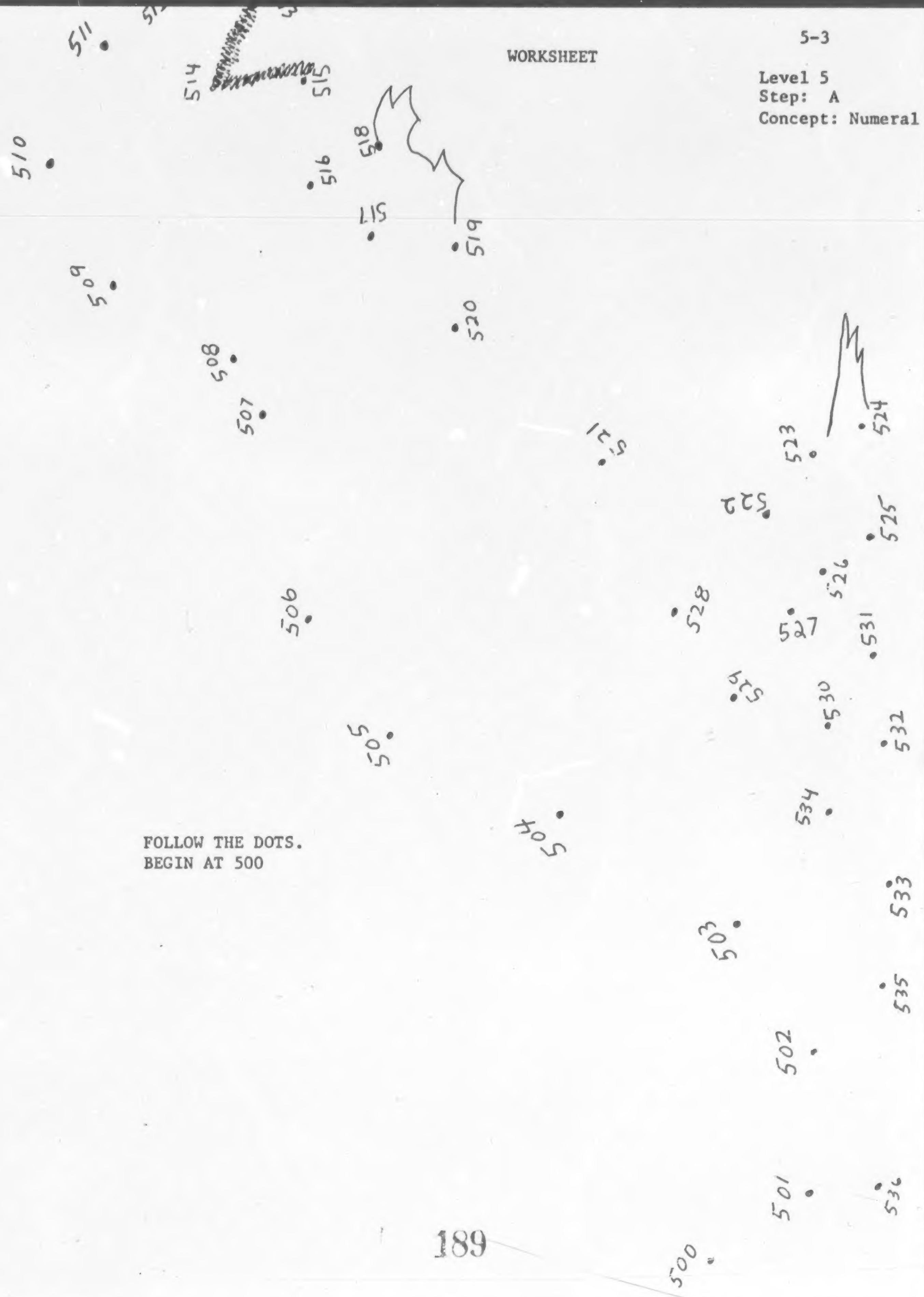
Addison-Wesley (1971, 1968) pp. 4-5

Other References:

Imperial Tapes (Primary) #14, 15.

WORKSHEET

Level 5
Step: A
Concept: Numeral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FOLLOW THE DOTS.
BEGIN AT 500

Level: 5 Step: A Concept: Order

I. Concept:

Order: Comparing 2 three-digit numerals

II. Behavioral Objective:

The student given 2 three-digit numerals will be able to show which number is greater, less, or equal to, by using the symbols "<", ">", "=".

III. Mathematical Ideas:

A. The inequality of two numbers can be expressed by the symbols "<", ">".

B. The order of cardinal numbers is expressed through the use or "<", ">".

C. The symbol " = " is used to show that numerals on either side of the equal sign name the same number.

IV. Vocabulary to Stress: greater than - less than - equals to - digit

V. Activities:

A. Ask a child to go to the board and write a number greater than 329 and another number less than 329 then place the correct symbols "<", ">", between the numbers.

B. Ask a child to write a three-digit numeral on the chalkboard. Ask a second child to write another three-digit numeral on the board leaving room for a third child to place the proper inequality symbol between the two numbers.

Text References:

Book: 1

Houghton Mifflin(1972) pp. 249

Book: 2

Addison-Wesley(1971, 1968) pp.185,(48), 186, 187-188, (49)

Book: 3

Houghton Mifflin(1967) pp. 18-19, (6), 21
Houghton Mifflin(1972) pp. 14-15, 18
Addison-Wesley (1971, 1968) p. 8

Level: 5 Step: A Concept: Order 5-5

NAME ____________

WORKSHEET

PUT ">" "<" or "=" in each ○.

1. 500 ○ 300
2. 403 ○ 402
3. 220 ○ 200
4. 900 ○ 906
5. 910 ○ 810
6. 533 ○ 539
7. 360 ○ 340
8. 451 ○ 458
9. 800 ○ 700
10. 504 ○ 304
11. 414 ○ 404
12. 604 ○ 654
13. 998 ○ 904
14. 804 ○ 804
15. 104 ○ 504
16. 304 ○ 307
17. 404 ○ 604
18. 804 ○ 809

NAME ____________________

5-6 Level: 5 Step: A Concept: Order

WORKSHEET

PUT ">" "<" or "=" in each ○.

1. 540 ○ 543
2. 240 ○ 440
3. 640 ○ 204
4. 940 ○ 940
5. 841 ○ 846
6. 140 ○ 110
7. 374 ○ 340
8. 648 ○ 645
9. 840 ○ 740
10. 527 ○ 392
11. 472 ○ 427
12. 622 ○ 628
13. 927 ○ 927
14. 927 ○ 817
15. 127 ○ 153
16. 327 ○ 329
17. 427 ○ 633
18. 827 ○ 820

NAME ____________________

Level: 5 **Step:** A **Concept:** Order 5-7

WORKSHEET

Put ">" "<" or "=" in each ○.

1. 113 ○ 288
2. 350 ○ 366
3. 770 ○ 669
4. 451 ○ 415
5. 162 ○ 260
6. 692 ○ 592
7. 510 ○ 501
8. 896 ○ 898
9. 247 ○ 299
10. 985 ○ 878
11. 416 ○ 652
12. 200 ○ 203
13. 539 ○ 540
14. 601 ○ 610
15. 211 ○ 212
16. 323 ○ 323

Level: 5 Step: A Concept: Addition

I. Concept:

Addition: Teaching basic facts with sums 16-18.

II. Behavioral Objective:

The student given two addends will be able to name the sums 16-18.

III. Mathematical Ideas:

A. Addition is the whole number operation that corresponds to the operation of joining disjoint sets.

B. Addition is commutative--the order in which the addends are added does not affect the sum.

C. **Sixteen is the compact numeral for 10 + 6**

D. Addition is associative. regroup to form 10.
Example: $9 + 7 = 9 + (1 + 6)$
$= (9 + 1) + 6$
$= 10 + 6$
Parentheses are used to indicate grouping.

E. Addition and subtraction are inverse operations.

F. Braces are symbols used to enclose a set whose members are listed or described. Example: {9, 7, 16}

G. Zero is the identity element for addition.

IV. Vocabulary to Stress:

pattern
order
ones

grouping
parenthesis
plus

sets
addends
sum

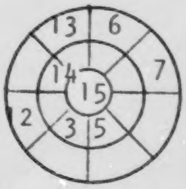
equation
equals

V. Activities:

A. "Baseball"--Home plate is at the front of the room. First, second and third bases are around the room. The students form two teams. A player from one of the teams acts as pitcher. He "pitches" questions such as, "What is the sum of 9 and 7?" A player from the other side "bats" the answer. If he is correct he goes to first base, if he is wrong he is "out". When three players are "out", the other team "bats" with a new pitcher.

B. "Four Bases"--Four students stand on four bases. The player on the first base names a number less than ten; the player on second base names a number that, added to the first number, gives a total of ten or less; the player on third base names a number that gives a final total of eighteen or less. The player on home base names the sum. Players on the bases are replaced if they make an error.

V. Activities: continued



C. Make a number wheel on the chalkboard. The two outer rings contain addends, the center, the sum. Students name the missing addends.

D. "Tournament"--Two teams, the White Knights and the Black Knights, line up facing each other. Have flash cards for sums of thirteen through eighteen on which a sum or addend is missing. Show the first card to the leaders of each team. The first to answer correctly captures his opponent and directs him to join his team. The team with more members at the end of the game wins.

E. "Check the Address"--You prepare envelopes on which you write a problem, one involving sums eighteen or less, with one number missing is an "address". Inside place a card with the answer. Each student is given an envelope. They read and solve the problem and then check their answer with the card inside. If correct, they may score a point. Envelopes may be exchanged after the problems are completed.

F. "Go Fish"--Children or teacher need to prepare cards for basic facts as, (9, 7, 16). Their cards will look like this:

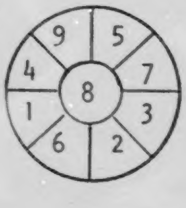
$\boxed{9 + 7 = 16}$ $\boxed{7 + 9 = 16}$ $\boxed{16 - 7 = 9}$ $\boxed{16 - 9 = 7}$

The object of the game is to acquire all four cards. The cards are dealt. The first player may say, "John, do you have $\boxed{9 + 7 = 16}$?" If John has the card he must surrender it; if not, he says, "Go Fish" and takes the next turn. The winner is the player who forms the most families.

G. "Solitaire"--The "Go Fish" cards described in Activity "F" may be used to play "Solitaire". A student deals out twelve of the cards face up. He is required to place another member of the family on any of the upturned cards. He "makes his game" if he uses up all his cards in this way.

H. "Picking Apples"--A paper or card board "apple tree" is placed on the bulletin board. Paper apples with a basic fact on it are fastened on the branches with thumb tacks. The student names the sum or missing addend. If correct, he may keep the apple. If not the apples goes back on the tree. Several students may compete to see who can collect the most apples.

I. "Don't Break the Chain"--Use the practice number wheel by starting with one student and going "around the room", witn each student naming the sum of the number in center of wheel and the number you point to in the circle. The challenge is to get around the room without breaking the chain. Adapt by putting other numerals in center of circle.



V. Activities: continued

J. "Drill Down"-- Choose two evenly matched teams. Give the first player on one team a combination. If he answers correctly within twenty seconds, continue by giving combination to next player on same team. If his answer is incorrect he sits down and opposing team gets a turn. The team with greatest number of players standing is the winner.

K. "Find the Joker"--Write groups of a family of facts on chalkboard. One fact you write should not belong. Have a child mark the one not belonging. As:

9 + 7   6 + 6   16 - 9   7 + 9   16 - 7

L. Correlate music and creative writing with mathematics. Try any melody children know or class make their own melody. Sing in rhyme; such as: Nine and seven are sixteen, are sixteen, are sixteen; nine and seven are sixteen, whenever they are seen.

M. Correlate art with mathematics. "Safe Landing"-Each child will need to make a kite, blimp or parachute with a basic fact written on it. Teacher calls out "Safe landing." Then name a sum between 13 and 18. All children holding basic facts for which that is a sum go to a designated target for a safe landing.

N. Correlate art with mathematics. "Island Hopping"-Draw islands on chalkboard with basic facts on them. Each child make a helicopter with a sum 13 to 18 on it. He may land his helicopter on the correct island. Children may exchange helicopters for the next game.

O. "Read My Mind"--Tell the group you are thinking of a combination whose sum is, example 18. If a child guesses the combination the teacher is thinking, the child takes the teacher's place. If he misses, another child gets to guess. Can be adapted for teams. The team naming the correct combination with the fewest guesses is the winning team.

P. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught
   1. Voluem One: #2, 6, (especially for Halloween), 8, (for any holiday), 13, 14, 35, 84.
   2. Volume Two: #2, 4, 15, 21, 23, 35.

Text References:

Book: 1

Houghton Mifflin (1972) pp. 293-300 (56) (60).
Addison-Wesley(1971, 1968) pp. 246, 250-251, 253-256 (68-72, 75).

Text References: continued

Book: 2

Houghton Mifflin (1967) pp. 135-136, (38-30), 137, 139-140, (31-34), 142, 233.
Houghton Mifflin (1972) addition and subtraction pp. 137-138, (28-29), 140, (30), 141-144, (31, 32, 33), 229.
Addison-Wesley (1971, 1968) pp. 87-88, (26), 90-96, (27, 28), 100, 102-103, (29), 108, (30), 110, (31), 112, (32), 114, 118, 120-122, 124, (33), 126.

Book: 3

Houghton Mifflin (1967) pp. 45, (14), 59. Use worksheets accompanying Book 2.
Houghton Mifflin (1972) pp. 43, Extra practice 319.
Addison-Wesley (1971, 1968) pp. 34-35 Supp. Ex. Set 2 (1).

Book: 4

Houghton Mifflin (1967) pp. 30. Use worksheets accompanying Book 2.
Houghton Mifflin (1972) pp. 36.

Level: 5 Step: A Concept: Subtraction

I. Concept:

Subtraction: Find the missing addend for sums 16-18.

II. Behavioral Objective:

The student given one addend and a sum of 18 or less will be able to name the missing addend.

III. Mathematical Ideas:

A. Subtraction is the inverse of addition.

B. The number operation related to separating sets is called subtraction.

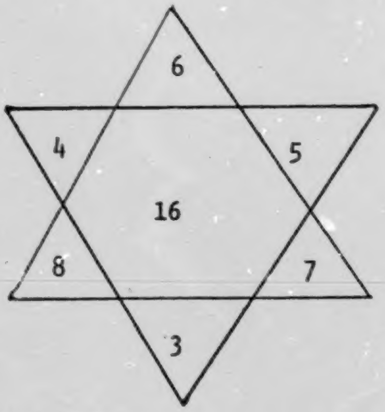
C. Subtraction is the renaming of a sum and an addend as the missing addend.

D. A compact numeral for 10 + 6 is 16.

IV. Vocabulary to Stress: minus sum addends

V. Activities:

A. Draw a star or wheel on the chalkboard. In the center of the star or wheel write a sum between 13-18. The numerals on the points will be one of the addends. The teacher will point to a numeral and ask the child to name the missing addend.



B. "Treasure Hunt"-Cut cardboard in interesting shapes about 3" x 5". Write a numeral less than 10 on each card. You will need several cards with the same numeral. Place the cards around the room, face down. The teacher will write a sum and one addend on the board. Choose a small group to go on the treasure hunt. The teacher will check to see how many found the correct missing addend. The ones with correct answers will be "checkers" for the next game. Children should replace the cards for the next game.

C. "Detective"--Name a child to be chief detective. He will appoint a few children to be deputies. The chief will tell his deputies some addends are missing. Hand out cards similar to those used in "Treasure Hunt". The chief will use a flash card with equation form, one addend missing. The deputies will go about the room searching for correct addends. Those holding correct answers will then be deputies.

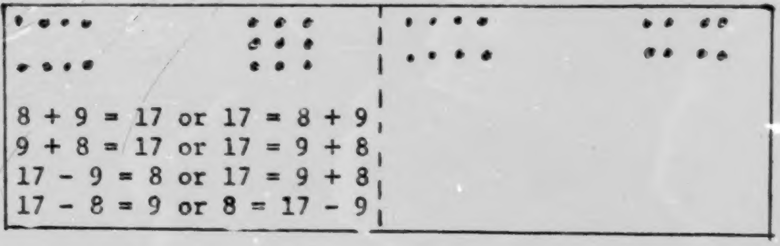
V. Activities: continued

D. "Flash Card Day"--Ask children to be partners. One member of each pair holds the cards and allows the other to answer. Then the other child holds the cards. To score the game, count the number of correct answers given without hesitation. These scores can be recorded on a chart under the date. The record will show each child's progress.

E. "Ladder to the Stars"--Draw ladders on the chalkboard. Write combinations on each rung. Top the ladders with red or gold stars, increasing the numbers to correspond with the difficulty of the combinations. Choose a capable child to monitor each ladder and give out gummed stars as they are earned. Assign four children at a time to begin at the bottom of the ladders to give the sums and differences just loud enough for the monitor to hear. Each child who reaches the top, gets the number of stars drawn there.

F. "Matching Game"--Make addition cards and related subtraction cards. Match the addition and subtraction combinations rather than to find sums and differences. Score a point for each match.

G. "Families"--Each child needs paste and paper (12 x 18 inches). and an envelope containing 40 brightly colored paper disks, 20 of one color and 20 of another. Tell the children to fold their papers into two sections and to decide on a combination between 11 and 18. Ask the children to choose two sets of disks to match the chosen combination and paste these on half of their paper. Then they choose another combination and paste matching sets of disks on the other half of the paper. When that is complete ask them to write the family of addition and subtraction facts to correspond to each set they illustrated.



8 + 9 = 17 or 17 = 8 + 9
9 + 8 = 17 or 17 = 9 + 8
17 - 9 = 8 or 17 = 9 + 8
17 - 8 = 9 or 8 = 17 - 9

H. "Number Riddles"--If you add me to 10, the sum is 16. If you subtract me from 10, the differences is 4. What number am I?

I. "Drill Derby"--Shuffle two sets of combination flash cards, and place them face down in two separate piles on a table. Choose two evenly matched teams. When the play begins, the first member of each team picks up the top flash card, races to the board, and writes the answer to the combination.

Score two points for finishing first and being correct, one point for the correct answer. Deduct five points if any team member tells another an answer.

V. Activities: continued

J. "Go to Jail"--Mark off a corner of the room as a jail. Have the class form two teams. Write an equation on the board (9 + 8 = 17). Ask a student from one team to write the opposite equation (17 - 9 = 8 or 17 - 8 = 9). If he fails he goes to jail. If he is correct he writes the next equation. One from the other team writes the opposite equation.

K. Adapt activities Level 5 - Step A - Concept Addition.

L. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught.
Volume Two: # 35, 71, 84.

Text References:

Book: 1

Houghton Mifflin (1972) pp. 295-300 (56) (60).
Addison-Wesley (1971, 1968) pp. 246, 250-251, 253-256, (68-72, 75).

Book: 2

Houghton Mifflin (1967) pp. 137, (28, 29, 30), 140, (31), 142, (32, 33, 34), 233.
Houghton Mifflin (1972) addition and subtraction pp. 137-138, (28, 29), 140, (30), 146, (31, 34).
Addison-Wesley (1971, 1968) pp. 97, 102-103, (29), 105-108, (30), 110, (31), 112, (32), 114, 124, 126, 130.

Book: 3

Houghton Mifflin (1967) pp. 48, 50, (16, 17). Use worksheets accompanying Book 2
Houghton Mifflin (1972) p. 44.
Addison Wesley (1971, 1968) pp. 36-37 Supp. Ex. Set 4 (3)

Book: 4

Houghton Mifflin (1967) p. 37.
Houghton Mifflin (1972) pp. 30-31.
Addison-Wesley (1971, 1968) pp. 24-25.

Level: 5 **Step:** A **Concept:** Addition & Subtraction

NAME____________________

SECRET CODES

SOLVE THE PROBLEMS TO FIND THE WORDS.

A	C	D	E	I	K	L	M	N	R
11	18	10	17	15	12	9	14	13	16

8		17	6	8	9		18	10	15
+7		-8	+9	+4	+8		-3	+8	+2

9	9	12	6	7		4	5	7
+9	+7	+5	+5	+7		+7	+8	+3

7	9	7	13
+11	+2	+5	+4

5-16 Level: 5 Step: A Concept: Multiplication

I. Concept:

Multiplication: Multiplying with 2 as a factor.

II. Behavioral Objective:

The student given a one-digit factor and 2 as the other factor will be able to rename them as a product.

III. Mathematical Ideas:

A. Multiplication is the number operation related to the joining of equivalent sets.

B. Multiplication is repeated addition of equal addends.

C. Multiplication is commutative.

D. Multiplication is the renaming of two factors as a product. One of the factors corresponds to the number of equivalent sets and the other factor to the cardinal number of each set. The product corresponds to the cardinal number of the union.

E. The horizontal (equation) form is the statement form. The vertical form is the computational form. The difference is in form only.

F. The symbol for multiplication is x.

IV. Vocabulary to Stress:

multiplication
times
product
equal addends
equals
multiply
factor

V. Activities:

A. Use array on chalkboard or flannel board.

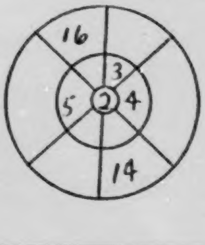
B. Use egg cartons to show factors in multiplication.

C. Ask student to find sets of objects in room to illustrate the objective.

D. Children may make up number stories involving multiplication with the factors being studied.

E. "I Am Thinking" - One student says, "I am thinking of a number multiplied by 2, the product is 14. What number am I thinking of?"

F. The number wheel can be used. The factor 2 is in the center. The outer ring is for the product.



V. Activities: continued

G. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught. Volume Two: #4, 6, 9, 12, 15, 16, 20, 28, 32, 36, 37, 44, 47, 53, 55, 59, 61, 78, 81.

Text References:

Book: 2

Houghton Mifflin (1967) pp. 281-290, (56), 291.
Houghton Mifflin (1972) pp. 287-294, (56).
Addison-Wesley (1971-1968) pp. 247, (67), 248, (68).

Book: 3

Houghton Mifflin (1967) pp. 126-128, (36).
Houghton Mifflin (1972) pp. 126-129, (32-33).

Other REferences:

Imperial Tapes (Primary) # 24, 34.

5-18 Level: 5 Step: A Concept: Multiplication

NAME ____________________

WORKSHEET

WRITE THE PRODUCT.

1. 2 x 4 = ______

2. 8 x 2 = ______

3. 2 x 5 = ______

4. 2 x 2 = ______

5. 2 x 6 = ______

6. 7 x 2 = ______

7. 3 x 3 = ______

8. 2 x 9 = ______

		x2
9.	2	
10.	8	
11.	5	
12.	9	
13.	3	
14.	7	
15.	4	
16.	6	

Level:5 Step: A Concept: Division 5-19

I. Concept:

Division: Division with 2 as a factor.

II. Behavioral Objective:

The student fiven 2 as a factor and a product not greater than 18 will be able to name the one-digit missing factor.

III. Mathematical Ideas:

A. Division is the inverse of multiplication.

B. Division is the renaming of the product and one factor with a missing factor.

C. C. Division is separation of a set into equivalent subsets.

D. Division is repeated subtraction.

IV. Vocabulary to Stress:

factor product division divided by (÷) ($\overline{)\quad}$)
equal separating quotient

V. Activities:

A. Egg cartons can be used as arrays to show factors.

B. Let's Play Games in Mathematics. Adapt games to meet needs of concept to be taught. Volume Three # 4, 13, 21, 62.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 130, 134.
Houghton Mifflin (1972) pp. 130-131.

5-20 Level: 5 Step: A Concept: Division

NAME ____________________

WORKSHEET

WRITE THE MISSING FACTOR.

1. 18 ÷ 2 = ________
2. 4 ÷ 2 = ________
3. 10 ÷ 5 = ________
4. 12 ÷ 6 = ________
5. 6 ÷ 2 = ________
6. 14 ÷ 2 = ________
7. 8 ÷ 4 = ________
8. 16 ÷ 8 = ________

÷2

9.	18	
10.	4	
11.	10	
12.	6	
13.	12	
14.	14	
15.	8	
16.	16	

I. Concept:

Measurement: Making change to 50 cents.

II. Behavioral Objective:

The student given a set of coins, half-dollar, quarter, dime, nickel, and penny and the cost of an item less than 50¢ will be able to make correct change.

III. Mathematical Ideas:

A. The penny is a coin with the value of 1 cent.

B. The nickel is a coin with the value of 5 cents.

C. The dime is a coin with the value of 10 cents

D. The quarter is a coin with the value of 25 cents.

E. The half dollar is a coin with the value of 50 cents.

F. The terms half-dollar and quarter refer to the coins.

G. The value of the coin is expressed in cents.

H. Making change involves the additive method by counting from the sum paid to the value of coins offered in exchange.

IV. Vocabulary to Stress:

coin
penny
nickel
dime
quarter
sum
make change
value
count
half-dollar

V. Activities:

A. Set up a grocery store. Have children bring small empty containers from home. Put price tags on containers. One child is the storekeeper. He will tell the shopper the total amount of the purchase. The storekeeper gives change for the purchase. Keep the purchases small.

B. Cut and paste pictures of toys, food, etc. on a piece of tagboard. Put the price on each. Let child "purchase" an item and count his change beginning with the cost of the item, adding up to the coin offered for pay.

C. "Which Would You Rather Have?"

7 pennies or 1 nickel and 1 dime
5 nickels or 2 quarters
3 dimes or 1 quarter

D. I'm Thinking of"--"I'm thinking of five coins that are worth 25¢. What are they?" Do this for various combinations making 50¢.

V. Activities: continued.

E. "Lost Moeny"--"I had 35¢. Now I have only 25¢. What coin did I lose?" Make other stories similar using 50¢ or less.

F. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught.
Volume One: #63, 84, 85, 89
Volume Two: #35, 48, 58, 71, 73, 80, 81, 102
Volume Three: #44

Text References:

Book: 1

Houghton Mifflin (1967) p. 238
Houghton Mifflin (1972) pp. 89-90, 184
Addison-Wesley (1971, 1968) pp. 124, 220, 265-266.

Book: 2

Houghton Mifflin (1967) p. 195.
Houghton Mifflin (1972) pp. 59, 139, 90, 214.
Addison-Wesley (1971, 1968) pp. 132, 238, (75), (76).

Book: 3

Houghton Mifflin (1972) p. 9.
Addison-Wesley (1971, 1968) pp. 52-53.

Other REferences:

Imperial Tapes (Primary) #37, 38.

Franklin Series, Learning About Measurement, pp. 94-101.

NAME ______________________

Level: 5 Step: A Concept: Measurement 5-23

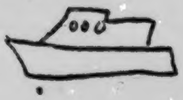
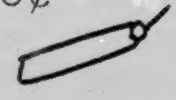
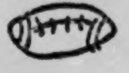
WORKSHEET

COST	PAID	CHANGE (DRAW COINS)	AMT.
1. 12¢	⑩ ⑩		
2. 20¢	㉕		
3. 28¢	㊿		
4. 21¢	㊿		
5. 38¢	㉕ ㉕		
6. 29¢	㉕ ⑩		
7. 14¢	㉕		
8. 35¢	㉕ ㉕		
9. 21¢	⑩ ⑩ ⑩		
10. 40¢	㉕ ⑩ ⑩		

5-24 Level: 5 Step: A Concept: Measurement

NAME ______________________

WORKSHEET

You Buy	Amt. Paid	How much change	1¢	5¢	10¢	25¢
39¢	50¢					
38¢ 	45¢					
12¢	25¢					
15¢	25¢					
30¢ 	50¢					
45¢ 	50¢					

Level: 5 Step: B Concept: Sets

I. Concept:

Sets: Separating a set into equivalent subsets.

II. Behavioral Objective:

The student given a set will be able to separate it into equivalent subsets.

III. Mathematical Ideas:

A. Fractional numbers are used to compare one or more subsets with the complete set.

B. A fraction is a numeral for a fractional number.

C. Equivalent sets have the same cardinal number.

IV. Vocabulary to Stress: equivalent set subset

V. Activities:

A. Have children place erasers, chalk, books, desks, or other objects into equivalent sets.

B. Use flannel board for pictures or other cut-outs to arrange in equivalent sets.

Text References:

Book: 2

Houghton Mifflin(1967) pp. 79-80, 231-232, 240, 245-246, 281-282
Houghton Mifflin(1972) pp. 77-78.

Other References:

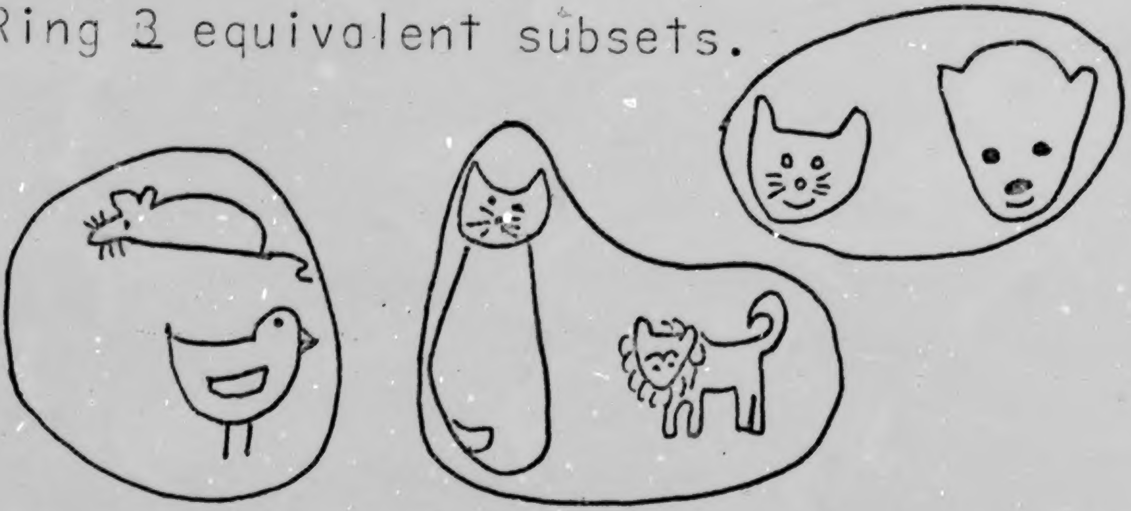
Imperial Tapes (Primary) #4

10-26 Level: 5 Step: B Concept: Sets

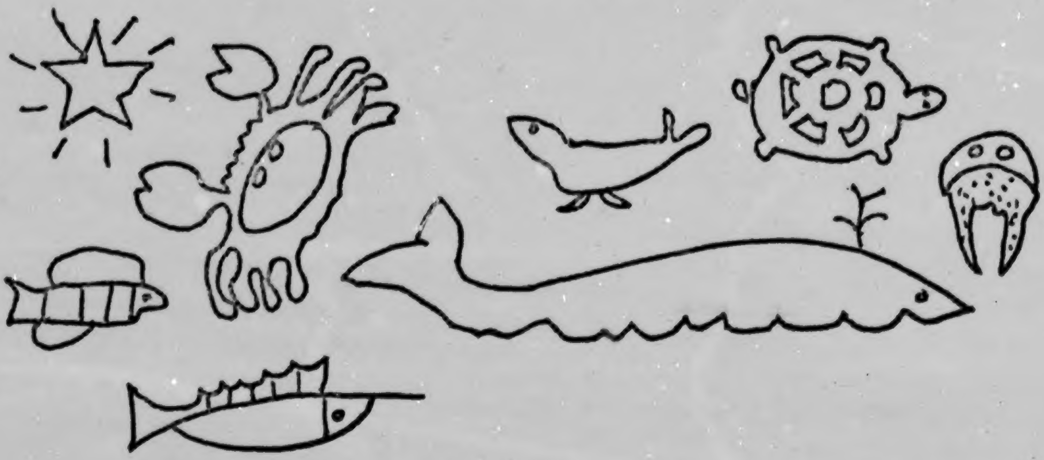
NAME ____________________

WORKSHEET

1. Ring 3 equivalent subsets.



2. Ring 2 equivalent subsets.

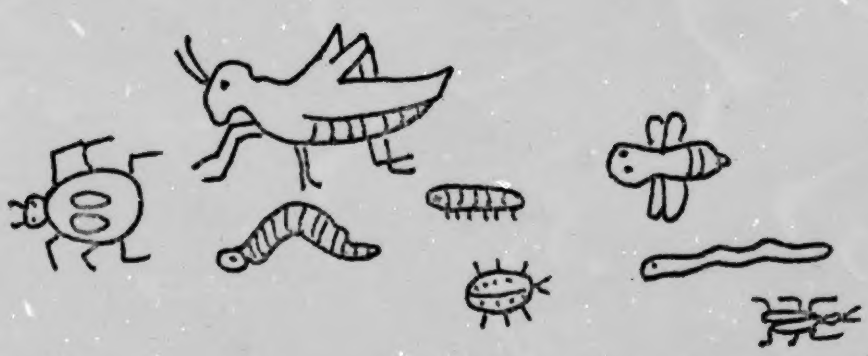


Level: 5 Step: B Concept: Sets 5-27

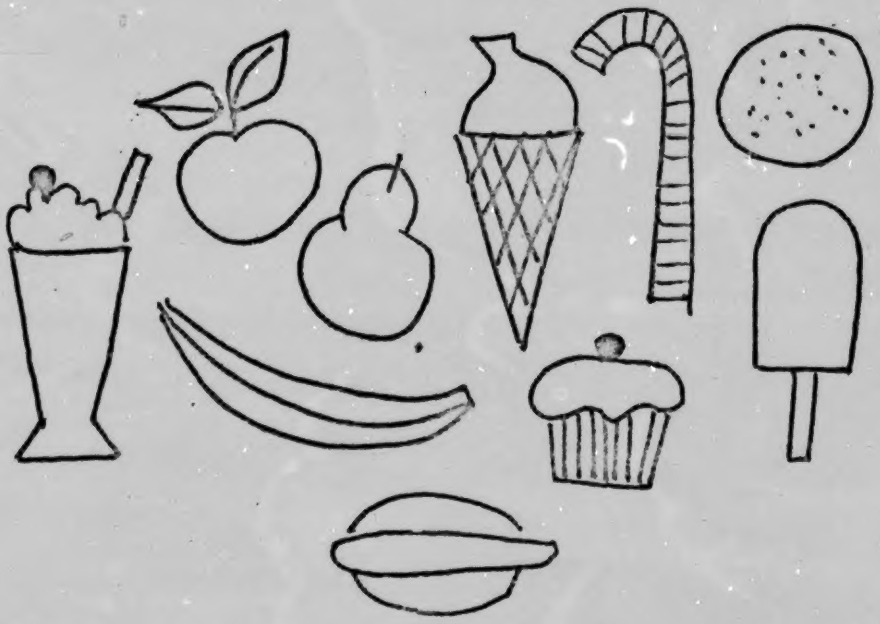
NAME ____________________

WORKSHEET

3. Ring 4 equivalent subsets



4. Ring 2 equivalent subsets

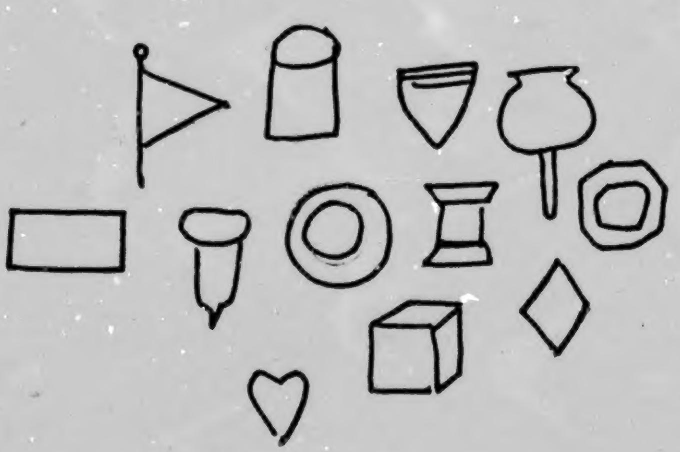


5-28 Level: 5 Step: B Concept: Sets

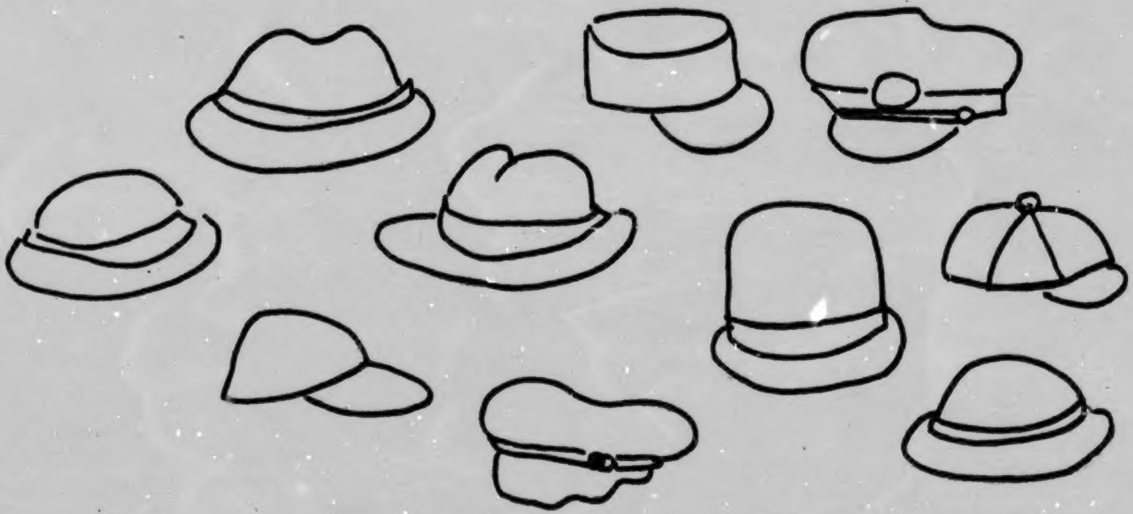
NAME ________________________

WORKSHEET

5. Ring 6 equivalent subsets



6. Ring 5 equivalent subsets

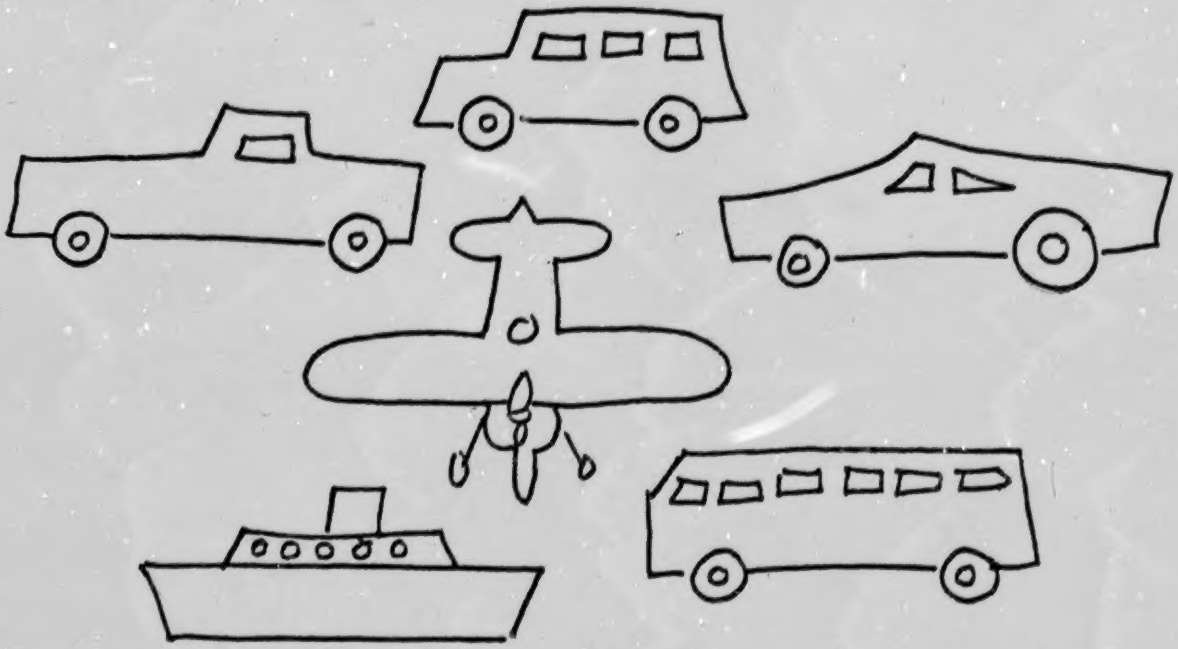


Level: 5 Step: B Concept: Sets 5-29

NAME ______________________

WORKSHEET

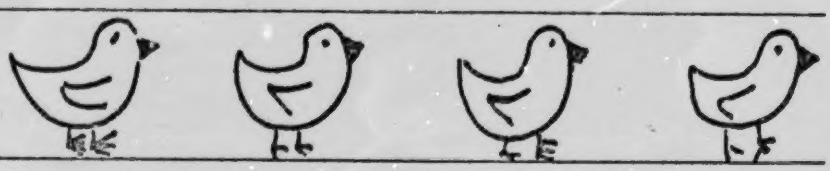
7. Ring 2 equivalent subsets



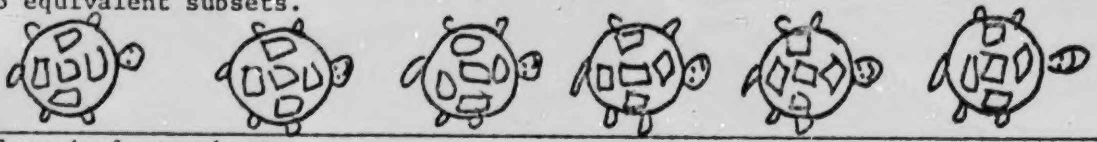
5-30 Level: 5 Step: B Concept: Sets

WORKSHEET NAME ______________________

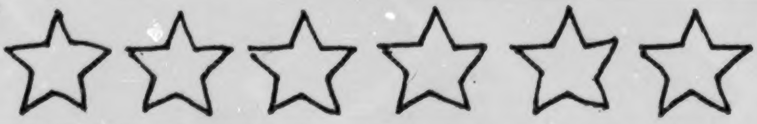
1. Ring 2 equivalent subsets.



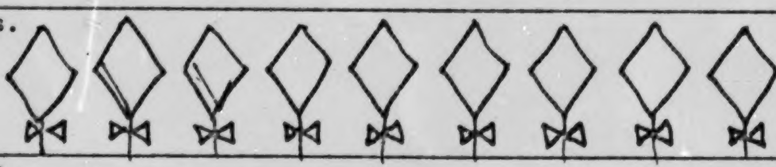
2. Ring 3 equivalent subsets.



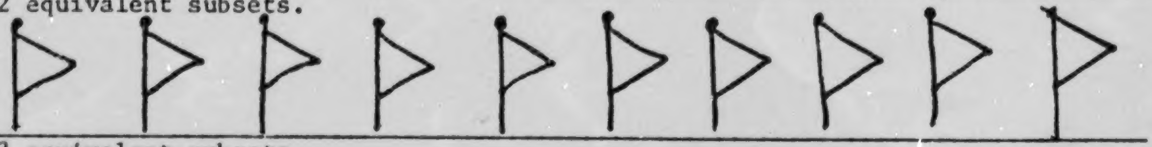
3. Ring 2 equivalent subsets.



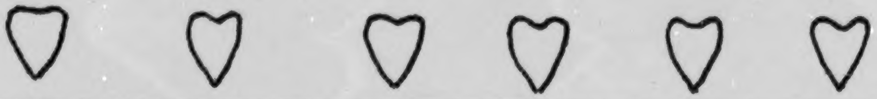
4. Ring 3 equivalent subsets.



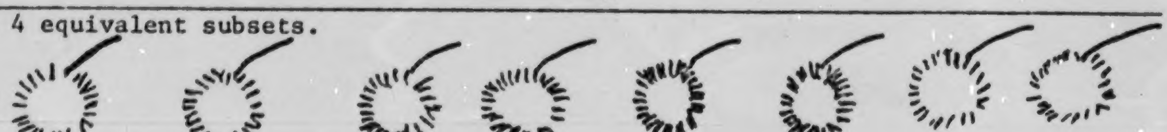
5. Ring 2 equivalent subsets.



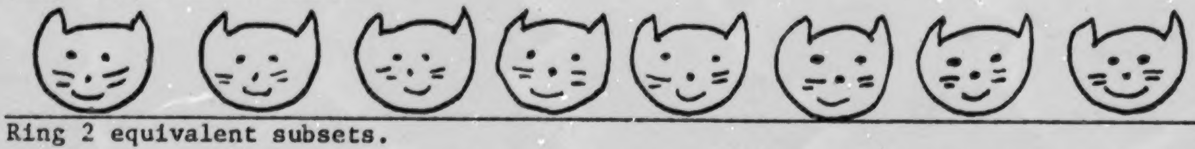
6. Ring 3 equivalent subsets.



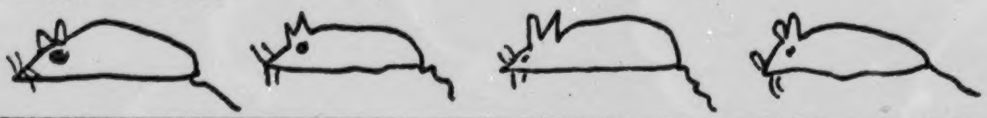
7. Ring 4 equivalent subsets.



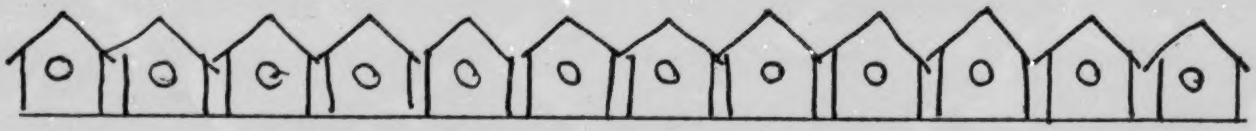
8. Ring 2 equivalent subsets.



9. Ring 2 equivalent subsets.



10. Ring 4 equivalent subsets.



I. Concept:

Numeral: Recognizing and naming ½ or ¼ of a set.

II. Behavioral Objective:

The student given a set will be able to identify and name ½ or ¼ of a set.

III. Mathematical Ideas:

A. ½ and ¼ are numerals that name fractional numbers.

B. If a set is divided into two equal parts, one of the parts is ½ of the original set.

C. If a set is divided into four equal parts, one of the parts is ¼ of the original set.

IV. Vocabulary to Stress:

set	one half	fractional number
equivalent	one fourth	

V. Activities:

A. Fold a sheet of colored construction paper in half. Ask how many parts there will be if you cut along the fold. Cover half of the sheet with a piece of white paper and ask what part of the red sheet is covered and what part is not covered. Fold the paper into fourths and have students show ¼. As the students name each part, you write the numerals "¼" and "one fourth" etc. on the chalkboard. Stress the meaning of the 1 and 4 in the numeral ¼.

B. Use the flannel board or bulletin board for simple arrangements. Use yarn to indicate ½ or ¼.

C. Have the children separate movable objects in the room into equivalent sets.

D. Children may use magazines to find objects. These can be cut out and pasted on colored paper. Then students could ring one half or one fourth.

E. Use egg cartons and colored yarn to show ½ or ¼.

F. Cut paper plates into fractional parts and label each part. Put together as a puzzle.

G. Draw four triangles on the board. Ask a child to put an x in ¼ or ½ of them.

H. Draw four circles on the board and underline ½ or ¼ of them.

I. Use children as the set. Describe as: ½ is girls.

V. Activities: Continued

J. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught
Volume Two #41, 60, 88.
Volume Three #6, 21, 25, 56, 58, 60, 70.

Text References:

Book: 1

Houghton Mifflin (1967) pp. 201-204, (30).
Houghton Mifflin (1972) pp. 207-208, (30), 309-310, (39).
Addison-Wesley (1971, 1968) pp. 277-278, (78).

Book: 2

Houghton Mifflin (1967) pp. 237-238.
Houghton Mifflin (1972) pp. 227-228, 233-234.
Addison-Wesley (1971, 1968) pp. 276, 279, 280, (78).

Other References:

Imperial Tapes #20, 21. (Primary).

Level: 5 Step: B Concept: Addition and Subtraction

I. Concept:

Addition and Subtraction: Solving word problems involving addition and subtraction with sum of 18 or less.

II. Behavioral Objective:

The student given a word problem with two addends or an addend and sum less than 18 will be able to determine the operation and solve the problem.

III. Mathematical Ideas:

A. Mathematical thinking involves identifying the sets and distinguishing between joining and separating the sets.

B. An equation is a statement about numbers.

C. Word problems require finding another name for the cardinal number of the sets in the problem.

IV. Vocabulary to Stress: addends - sum - equation - equals

V. Activities:

A. Word problems involivng sums less than 18 may be read by the teacher. (Use following pages).

B. Have children make stories relating to their own experiences, using numbers 18 or less.

Text References:

Book: 2

Houghton Mifflin(1967)	p.	138.
Houghton Mifflin(1972)	pp.	155-156.
Addison Wesley (1971, 1968)		pp. 55, 67, 113, (34) 117, 125, 127.

Book: 3

Houghton-Mifflin(1967)	pp.	46-47, (15), 49, 54-55
Houghton-Mifflin(1972)	pp.	46-48
Addison Wesley (1971, 1968)		pp. 29, 38, (5).

Level: 5 Step: B Concept: Addition and Subtraction

WORKSHEET NAME ____________________

Activity A ----- Problems teachers may read to class.

1. If there are 11 dogs and 8 doghouses, how many dogs do not have their own doghouse?
2. If 16 frogs are sitting on a rock by a pool and 7 frogs jump in the pool, how many frogs are left sitting on the rock?
3. The circus had 8 clowns with blue hats and 5 clowns with yellow hats. How many clowns had hats?
4. Harry is running an 8 lap race. He has already run 6 laps. How many laps does he still have to run?
5. There are 13 boys going on a bike ride. There are 4 fathers going with them. How many are going on the bike ride?
6. At the school picnic De-De counted 9 ants on her apple. Tina counted 6 ants on her orange. How many ants did both girls see at the picnic?
7. Don had 7 blue cars. Ron had 8 green cars. How many more cars did Ron have than Don?
8. There are 16 children in the class. If 9 of the children are boys, how many are girls?
9. If 14 monkeys did tricks at the zoo and 3 seals did tricks at the zoo, how many animals did tricks?
10. There are 17 pink houses on Green Street. If 8 of them need paint, how many houses do not need paint?
11. If I have 18 cookies and I gave away 9 cookies, how many cookies will I have then?
12. A baker made 14 pies. He sold 9 of the pies. How many pies were not sold?
13. In our school room there are 8 seats in the first row and 6 seats in the second row. How many seats are there in both rows?
14. There are 9 chairs at one table and 5 chairs at another table. How many chairs are there in all?
15. Bob had 9 pages of paper. He used 6 pages. How many pages of paper did he then have?
16. Two boys were playing basketball. Tom made 7 baskets and Jim made 5 baskets. How many baskets did they make in all?
17. Paper costs 12¢ and a pencil costs 5¢. How much do they both cost?

Level: 5 **Step:** B **Concept:** Addition & Subtraction 5-35
SETS

WORKSHEET NAME ______________________

WRITE THE EQUATION AND SOLVE THE PROBLEM.

1. A 🦘 took 9 hops and then he took 7 hops. How many hops did the 🦘 take?

□ ○ □ = □

2. Bill caught 5 🐟 and Tom caught 4 🐟. How many 🐟 did they catch in all?

□ ○ □ = □

3 A cat had 6 🐱. Another cat had 5 🐱. How many 🐱 did the two cats have?

□ ○ □ = □

4. Tom had 7 🍎. He gave 3 🍎 away to his friends. How many 🍎 did Tom have left?

□ ○ □ = □

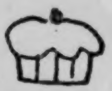
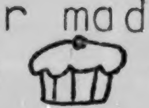
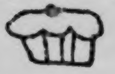
5. Patty made 10 ♡ on Saturday. She made 8 ♡ on Sunday. How ♡ many did Patty make in the two days?

□ ○ □ = □

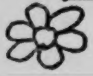
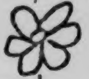
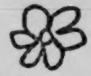
5-36 Level: 5 Step: B Concept: Addition & Subtraction

NAME ______________________

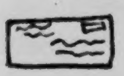
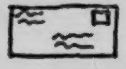
WORKSHEET

6. Mother made 17  . The family ate 8  for dinner. How many  were left?

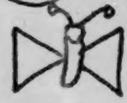
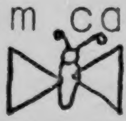
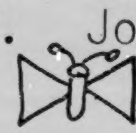
□ ○ □ = □

7. Mary picked 8  . Jane picked 7  . How many  did the two girls pick?

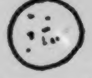
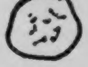
□ ○ □ = □

8. Mother wrote 6  on Saturday 6  on Sunday. How many letters did she write in all?

□ ○ □ = □

9. Jim caught 5  . John caught 8  . How many  did the two boys catch?

□ ○ □ = □

10. There were 18  in the cookie jar. The children ate 9  . How many were left in the cookie jar?

□ ○ □ = □

I. Concept:

Multiplication: Multiplying with 5 as a factor.

II. Behavioral Objective:

The student given a one-digit factor and 5 as the other factor will be able to rename them as a product.

III. Mathematical Ideas:

A. Multiplication is the number operation related to the joining of equivalent sets.

B. Multiplication is repeated addition of equal addends.

C. Multiplication is commutative.

D. Multiplication is the renaming of two factors as a product. One of the factors corresponds to the number of equivalent sets and the other factor to the cardinal number of each set. The product corresponds to the cardinal number of the union.

E. The horizontal (equation) form is the statement form. The vertical form is the computational form. The difference is in form only.

IV. Vocabulary to Stress:

multiplication	product	equals	factor
times (x)	equal addends	multiply	

V. Activities:

A. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught.
Volume Two #4, 6, 9, 15, 16, 20, 28, 32, 36.

Text References:

Book: 2

Houghton Mifflin (1967) pp. 293-296 (57), 297-300.
Houghton Mifflin (1972) pp. 297-302, (57).
Addison-Wesley (1971, 1968) pp. 248, 258, 260.

Book: 3

Houghton Mifflin (1967) pp. 141-143.
Houghton Mifflin (1972) pp. 142-144.

Other References:

Imperial Tapes (Primary) #24, 34

5-38 Level: 5 Step: B Concept: Multiplication

NAME ____________________

WORKSHEET

WRITE THE PRODUCT ON THE BLANK

1. 5 x 5 = ________

2. 5 x 9 = ________

3. 7 x 5 = ________

4. 3 x 5 = ________

5. 5 x 8 = ________

6. 2 x 5 = ________

7. 5 x 4 = ________

8. 6 x 5 = ________

	x5	
9.	7	
10.	3	
11.	9	
12.	5	
13.	6	
14.	4	
15.	8	
16.	2	

Level: 5 Step: B Concept: Division

I. Concept:

Division: Division with 5 as a factor.

II. Behavioral Objective:

The student given 5 as a factor and a product not greater than 45 will be able to name the one-digit missing factor.

III. Mathematical Ideas:

A. Division is the inverse of multiplication.

B. Division is the renaming of the product and one factor with a missing factor.

C. Division is separation of a set into equivalent subsets.

D. Division is repeated subtraction.

IV. Vocabulary to Stress:

factor
equal
product
separating
division
quotient
divided by (÷) (⟌)

V. Activities:

A. Use array on chalkboards orflannel boards.

B. Egg cartons can be used as arrays to show factors.

C. Let's Play Games in Mathematics: Adapt each game to meet needs of concept to be taught
Volume Three #4, 13, 21, 62.

Text References:

Book: 3

Houghton Mifflin (1967) p. 143.
Houghton Mifflin (1972) p. 144.

Other References:

Imperial Tapes (Primary), #29.

Countdown (Economy Company), Tapes and Lessons 45-50.

5-40 Level: 5 Step: B Concept: Division

NAME ________________

WORKSHEET

WRITE THE MISSING FACTORS.

1. 35 ÷ 7 = ________

2. 20 ÷ 5 = ________

3. 10 ÷ 2 = ________

4. 25 ÷ 5 = ________

5. 40 ÷ 8 = ________

6. 15 ÷ 5 = ________

7. 30 ÷ 5 = ________

8. 45 ÷ 9 = ________

÷5

9.	10	
10.	45	
11.	15	
12.	20	
13.	30	
14.	25	
15.	40	
16.	35	

Level: 5 Step: B Concept: Functions and Graphs

I. Concept:

Functions and Graphs: Number plane.

II. Behavioral Objective:

The student given a number plane will be able to locate designated points

III. Mathematical Ideas:

A. A point on a number line may be located by means of a single number.

B. A point on a number plane may be located by means of an ordered pair (as row 3, desk 5). The first number locates the point on the horizontal number line. The second of these numbers locates the point on the vertical number line. The point is the intersection of the 2 lines.

IV. Vocabulary to Stress:

number plane
points
right
left
map
horizontal
vertical
intersection

Text References:

Book: 2

Houghton Mifflin(1972) pp. 249-250

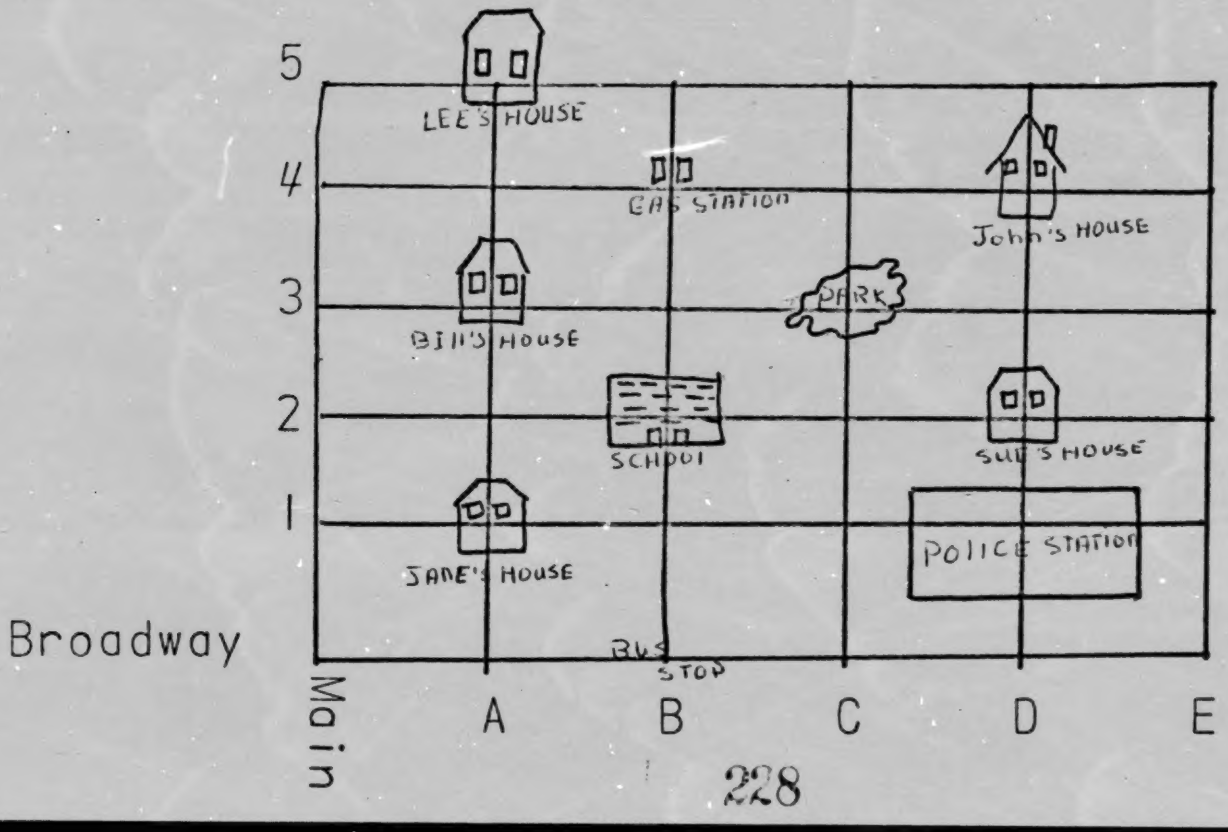
5-42 Level: 5 Step: B Concept: Functions & Graphs

NAME ____________________

WORKSHEET

Name the location

Lee's house (A,5)
Police station ________
Gas station ________
Bill's house ________
Sue's house ________
School ________
Park ________
John's house ________
Bus stop ________
Jane's house ________


5
4
3
2
1
LEE'S HOUSE
GAS STATION
JOHN'S HOUSE
PARK
BILL'S HOUSE
SCHOOL
SUE'S HOUSE
POLICE STATION
JANE'S HOUSE
BUS STOP
Broadway
Main
A
B
C
D
E

NAME ____________________

WORKSHEET

Locate David's desk

Frank's ______

Polly's ______

Will's ______

Paul's ______

Cathy's ______

Jack's ______

Linda's ______

John's ______

Bill's ______

Jane's ______

3.	Cathy	John	Mary	Ann	David
2.	Bill	Will	Frank	Linda	Jane
1.	Polly	Kim	Paul	Dick	Jack
	A	B	C	D	E

Level: 5 Step: B Concept: Measurement

I. Concept:

Measurement: Telling time to quarter of an hour.

II. Behavioral Objective:

The student given a clock face will be able to tell time to the quarter-hour.

III. Mathematical Ideas:

A. Telling time is an indirect measurement. Telling time involves the motion of an object from one set place to another.

B. The constant changing of the hands of the clock indicate changes in proportion to the passing of time.

C. The quarter-hour is a standard unit of time.

D. Telling time is finding how much the clock has changed.

IV. Vocabulary to Stress: hour - half-hour - quarter-hour - o'clock

V. Activities:

A. Use practice clocks to show designated time. Children may know different ways of expressing the same time.

B. Make a time table for the school day.

C. Give each child his individual clock. As you tell a story involving a quarter-hour have children set their own clocks to show the time mentioned.

D. Each child write his own story involving telling time. Ask him to draw clock faces instead of words.

E. Make a transparency of a clock face. Draw hands to show hour, half-hour, and quarter-hour.

F. Use individual clocks (in your library).

G. Play Tell Time Quizzmo (in your library).

Text References:

Book: 2

Houghton-Mifflin(1967)	pp.	85-86, (review hr. & half hr.,), 242.
Houghton-Mifflin(1972)	pp.	239-240
Addison Wesley	pp.	136

Text References: continued

Book: 3

Houghton Mifflin (1967) p. 150.
Houghton Mifflin (1972) p. 150.

Other References:

Imperial Tape (Primary), #12

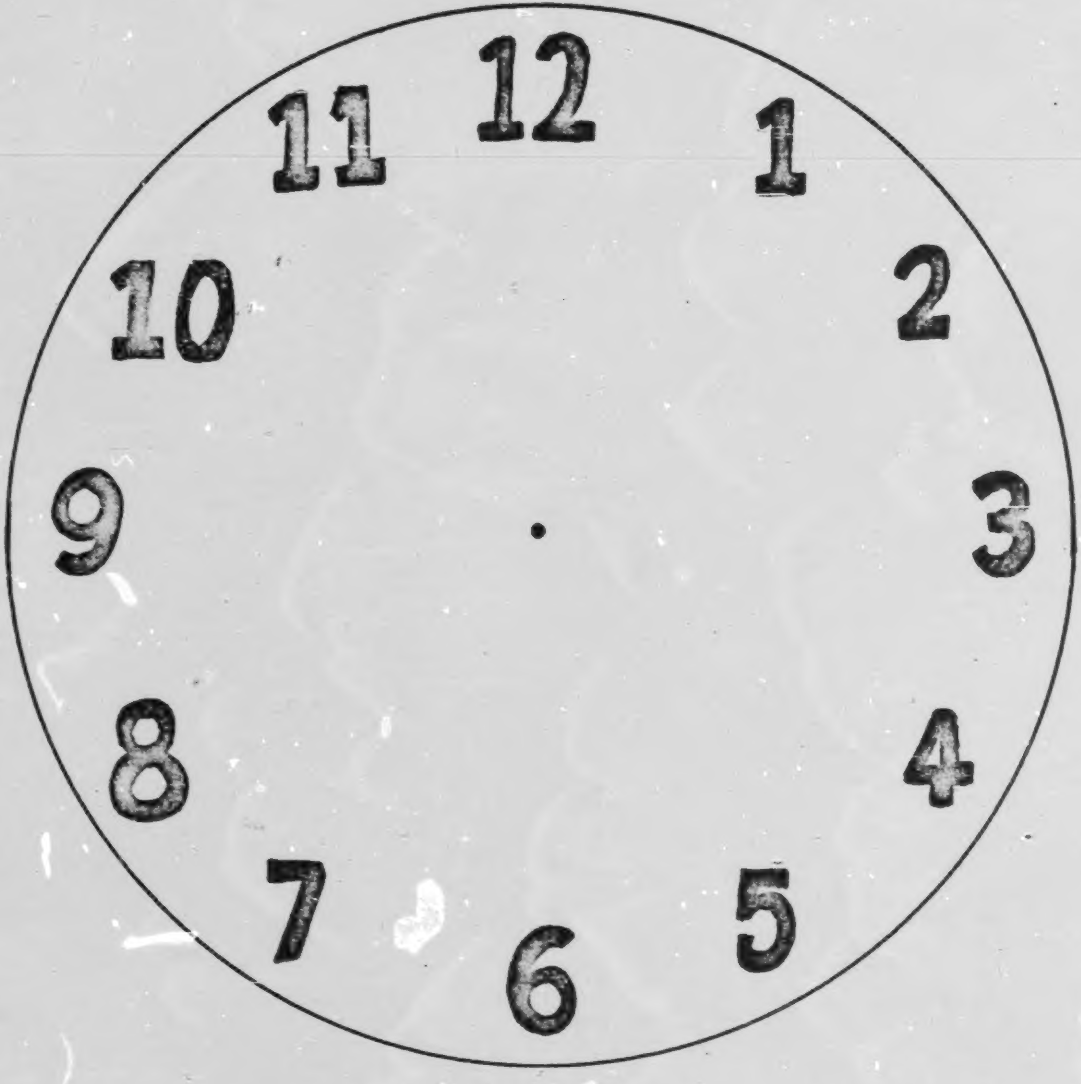
Franklin Series, Learning About Measurement, pp. 74-84.

5-46

Level: 5 Step: B Concept: Measurement

NAME ______________________________

WORKSHEET


12
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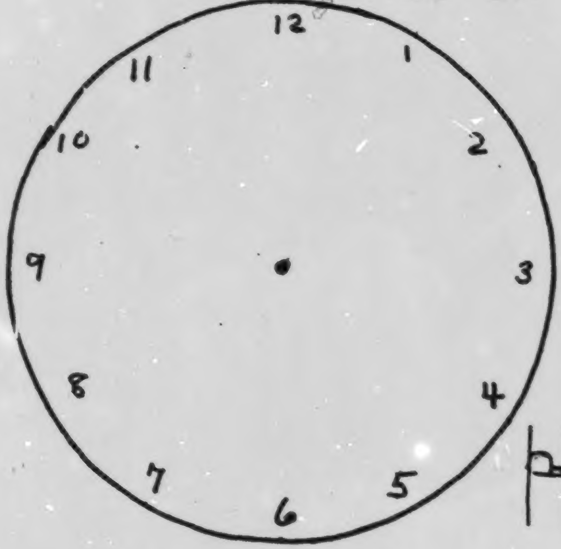
Make hands on the clock to show the time.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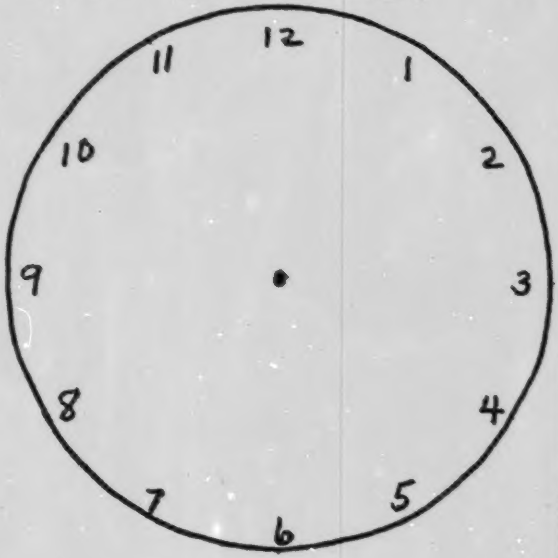
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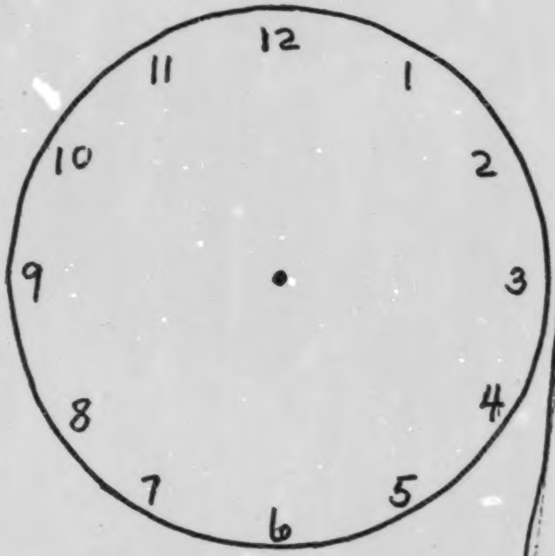
get up at 7:00

school begins at 8:30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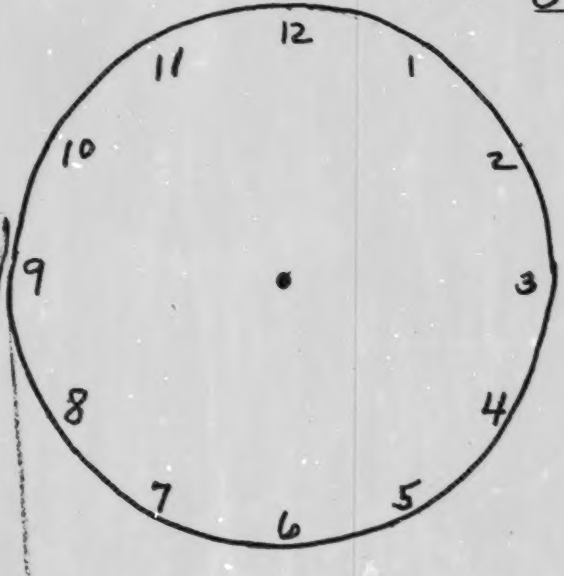
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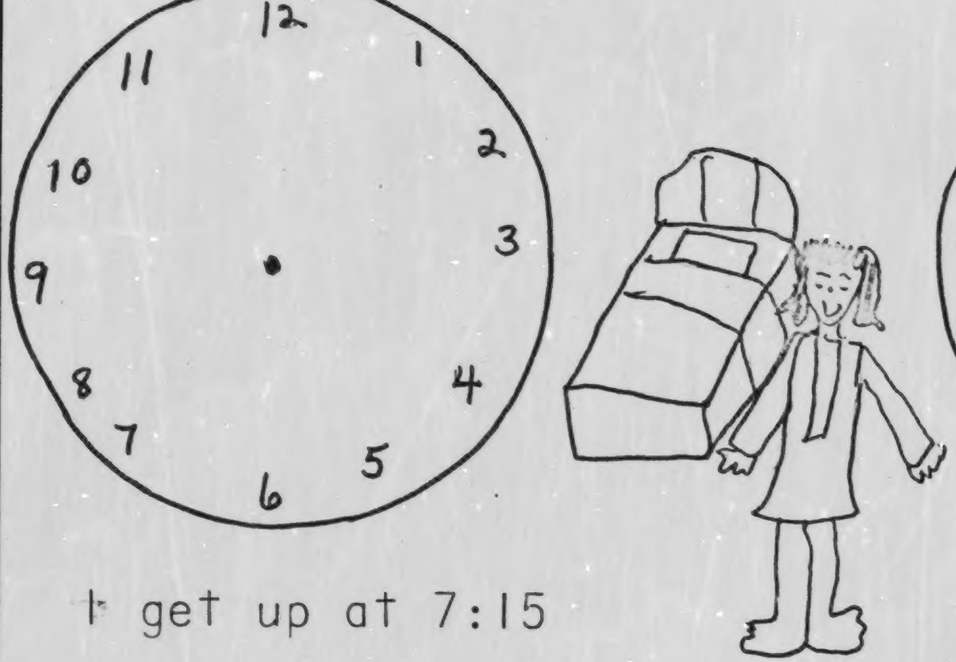
11

we play at 10:30

lunch is at 11:45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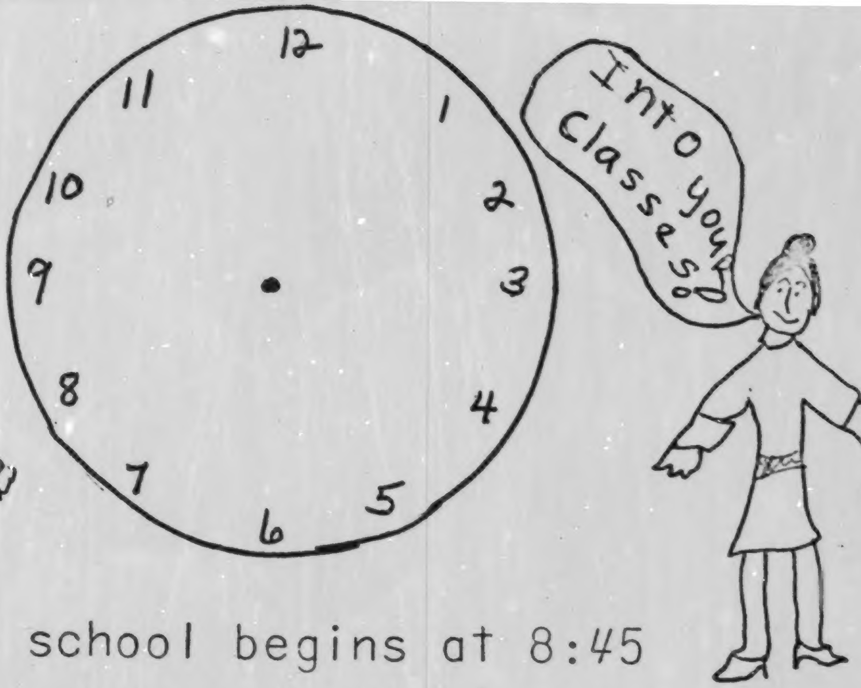
I get up at 7:15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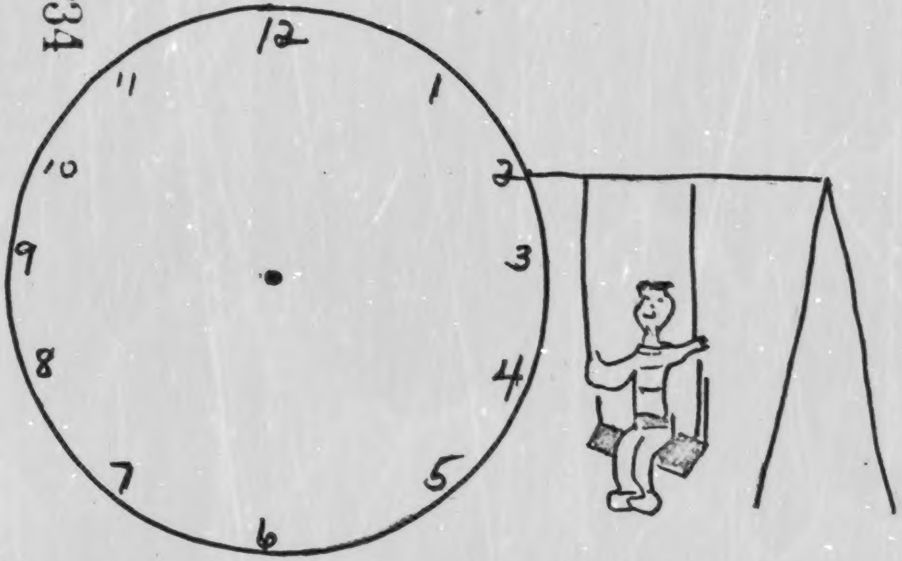
11
Into your Classes!

school begins at 8:45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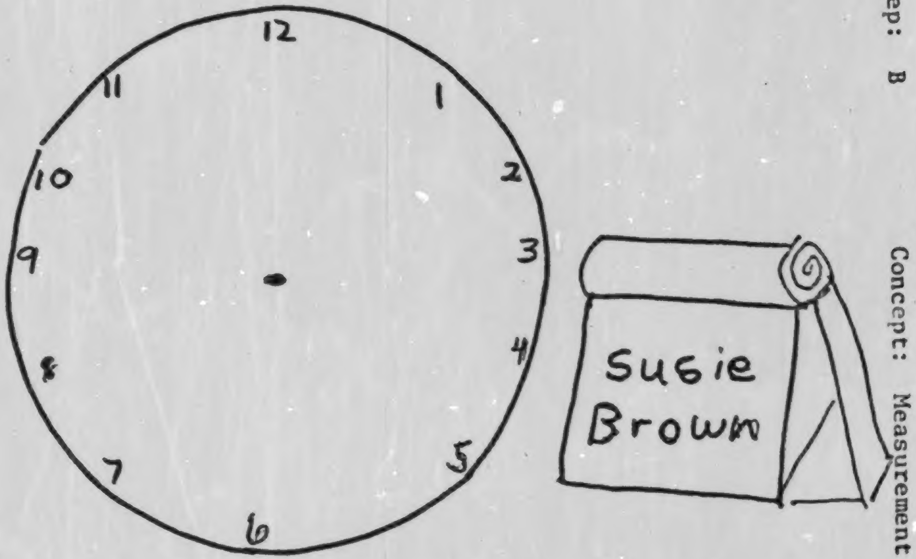
11

we play at 10:15


12
1
2
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4
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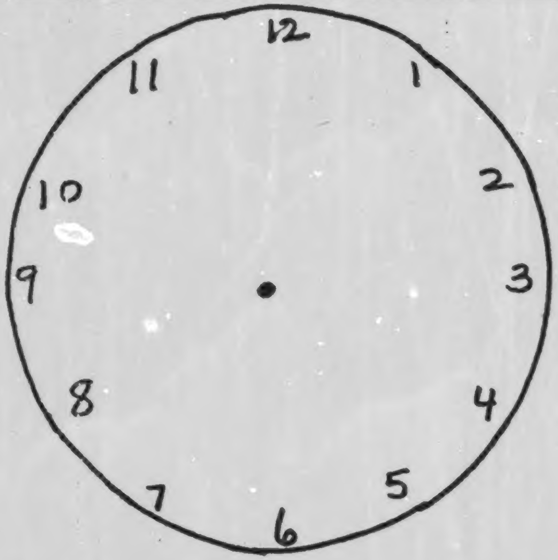
10
11
Susie Brown

lunch is at 11:30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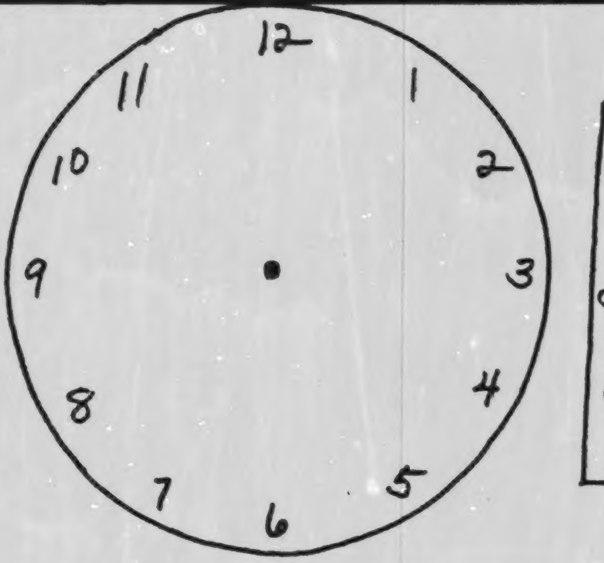
10
11

Both my hands I give to thee. Come here partner dance with me

we have music at 1:45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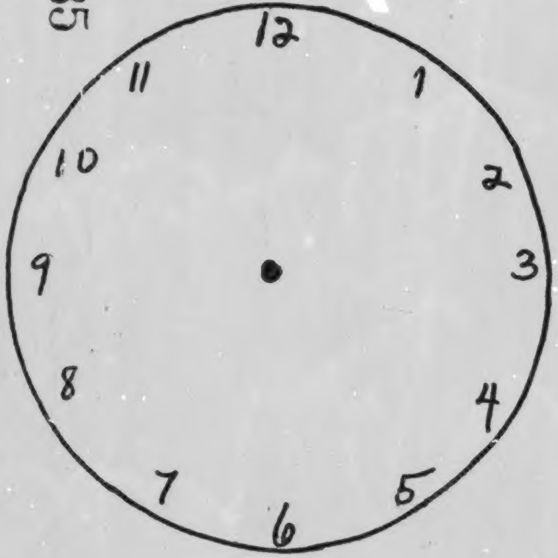
SCHOOL
HURRAY!

school ends at 3:15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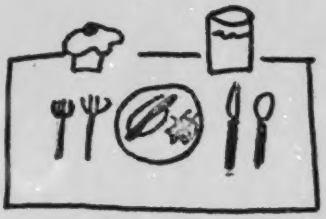
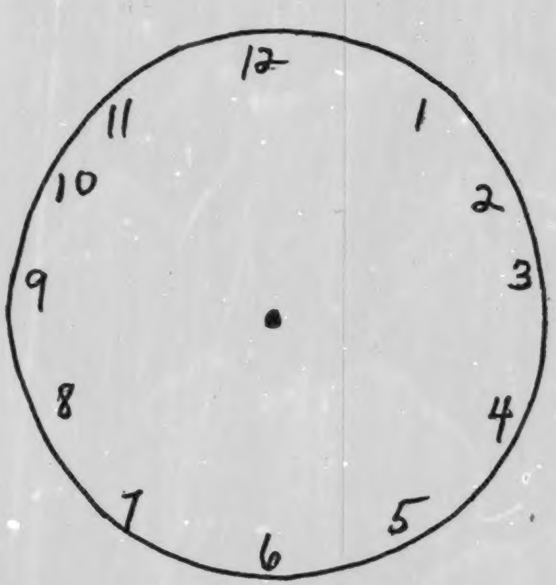


we eat at 6:00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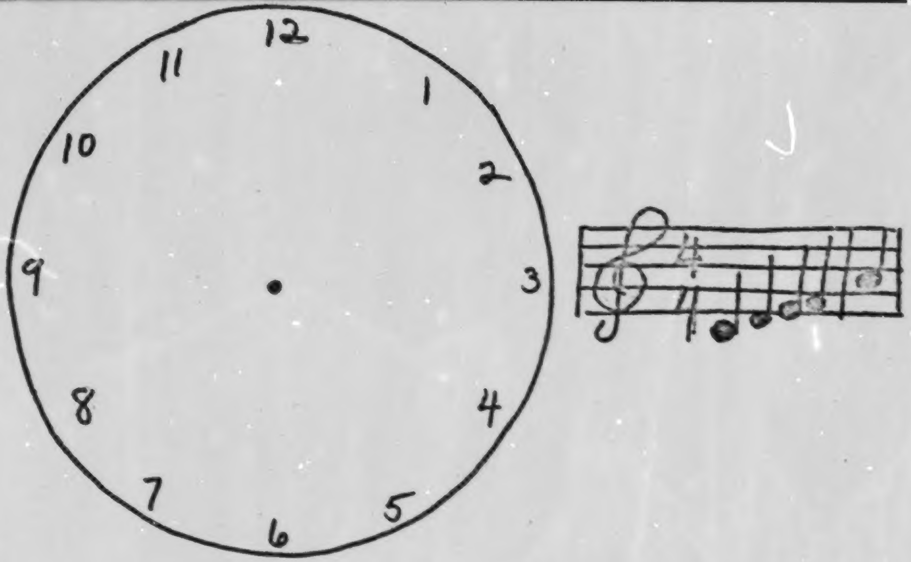
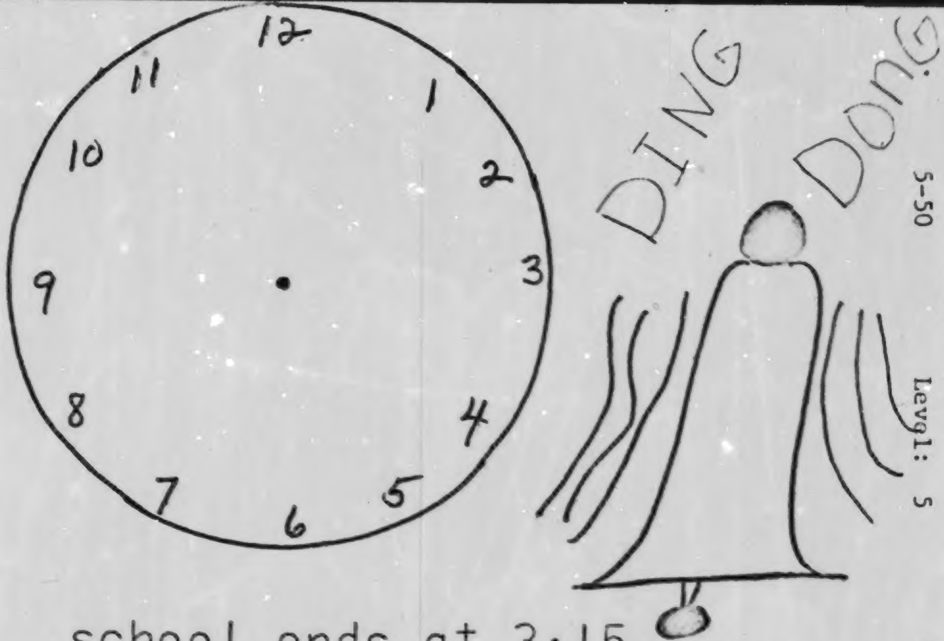
11

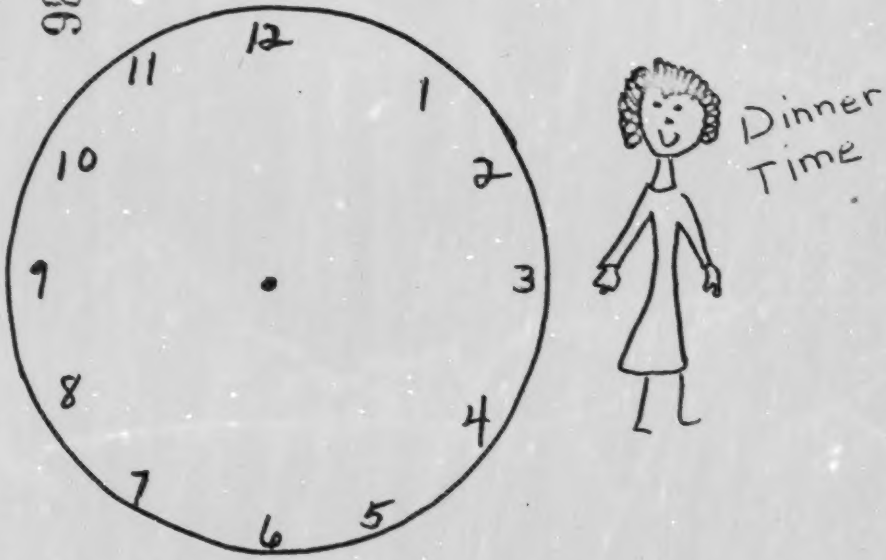
I go to bed at ________



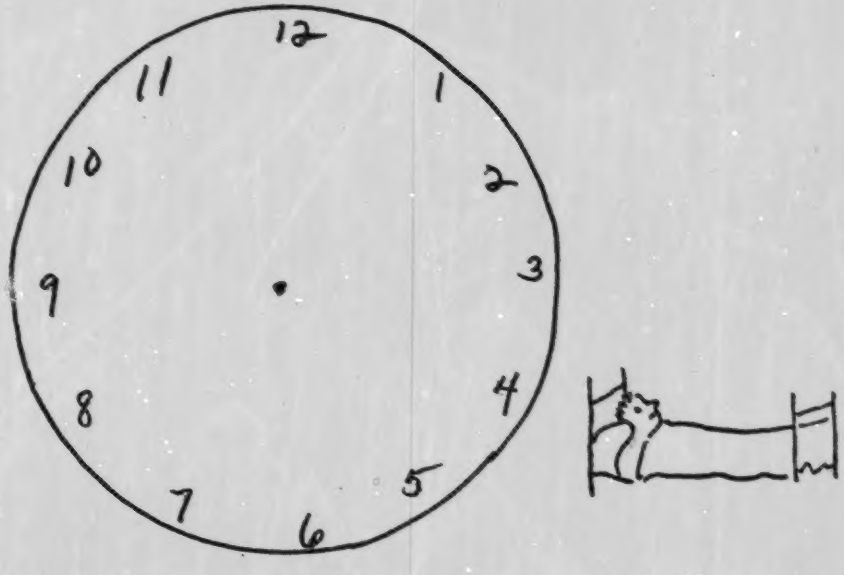
we have music at 2:45



school ends at 3:15


Dinner Time

we eat at 6:00



I go to bed at ____.

ANSWERS TO WORKSHEETS

5-5

1. >
2. >
3. >
4. <
5. >
6. <
7. >
8. <
9. >
10. >
11. >
12. <
13. >
14. =
15. <
16. <
17. <
18. <

5-6

1. <
2. <
3. >
4. =
5. <
6. >
7. >
8. >
9. >
10. >
11. >
12. <
13. =
14. >
15. <
16. <
17. <
18. >

5-7

1. <
2. <
3. >
4. >
5. <
6. >
7. >
8. <
9. <
10. >
11. <
12. <
13. <
14. <
15. <
16. =

5-15

I LIKE ICE
CREAM AND
CAKE

5-18

1. 8
2. 16
3. 10
4. 4
5. 12
6. 14
7. 9
8. 18
9. 4
10. 16
11. 10
12. 18
13. 6
14. 14
15. 8
16. 12

5-20

1. 9
2. 2
3. 2
4. 2
5. 3
6. 7
7. 2
8. 2
9. 9
10. 2
11. 5
12. 3
13. 6
14. 7
15. 4
16. 8

5-23

Amt.

1. ______ 8¢
2. ______ 5¢
3. ______ 22¢
4. ______ 29¢
5. ______ 12¢
6. ______ 6¢
7. ______ 11¢
8. ______ 15¢
9. ______ 9¢
10. ______ 5¢

5-24

How much
change

1. 11¢
2. 7¢
3. 13¢
4. 10¢
5. 20¢
6. 5¢

5-26

Objects in
each set.

1. 2
2. 4
3. 2
4. 5
5. 2
6. 2
7. 3

5-30

Objects in
each set.

1. 2
2. 2
3. 3
4. 3
5. 5
6. 2
7. 2
8. 4
9. 2
10. 3

5-34

1. 3
2. 9
3. 13
4. 2
5. 17
6. 15
7. 1
8. 7
9. 17
10. 9
11. 9
12. 5
13. 1[illegible]
14. 14
15. 3
16. 12
17. 7

5-35—5-36

1. 16
2. 9
3. 11
4. 4
5. 18
6. 9
7. 15
8. 12
9. 13
10. 9

5-38

1. 25
2. 45
3. 35
4. 15
5. 40
6. 10
7. 20
8. 30
9. 35
10. 15
11. 45
12. 25
13. 30
14. 20
15. 40
16. 10

5-40

1. 5
2. 4
3. 5
4. 5
5. 5
6. 3
7. 6
8. 5
9. 2
10. 9
11. 3
12. 4
13. 6
14. 5
15. 8
16. 7

5-42

Police	D,1
Gas	B,4
Bill's	A,3
Sue's	D,2
School	B,2
Park	C,3
John	D,4
Bus	B,Broadway
Jane	A,1

5-43

Frank	C,2
Polly	A,1
Will	B,2
Paul	C,1
Cathy	A,3
Jack	E,1
Linda	D,2
John	B,3
Bill	A,2
Jane	E,2

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Level: 6 Step: A Concept: Addition

I. Concept:

Addition: Two or three place addition without renaming.

II. Behavioral Objective:

The student given two or three-place addends, the total of any column less than ten, will be able to name the sum.

III. Mathematical Ideas:

A. Addition is commutative.

B. The value of any digit is ten times the value of the same digit to the right.

C. In a three digit numeral the third place from the right is the hundreds' place, the second place from the right is the tens' place. The first place on the right is the ones' place.

D. Two and three-digit numerals are added in pairs, the ones, the tens, and the hundreds, and the results combined.

E. Zero is the identity element for addition.

F. Expanded notation for three digit numerals involves expressing a number as the sum of its hundreds, tens, and ones.

IV. Vocabulary to Stress:

addends	ones	hundreds	equals
sum	tens	digit	value

V. Activities:

A. Use the abacus.

B. "Chain Gang": One student writes an example on the chalkboard. Other students take turns completing the example. If the example is 24 + 31, the first student says, "Twenty four equals 20 + 4". The second student says, "Thirty one equals 30 + 1", the third student adds the ones, the fourth student adds the tens, the fifth student names the sum of the tens and ones. This can be adapted to use with 3-digit numerals also.

C. Complete the number pattern horizontally and vertically.

300	50	1	
600	20	8	

D. Make a simplified map. Use three-digit numerals without renaming for distances to be measured.

V. Activities: continued

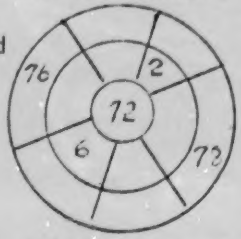
E. "Cross Over the Bridge": Choose two evenly matched teams. Line them in such a way there is a space between the two teams for a "river". The imaginary bridge is at the front of the room. Put a two or three place addition problem on the board. If a member of one team fails to give correct answer and the other team gives the correct answer they may call "Cross Over the Bridge" to the one giving incorrect answer.

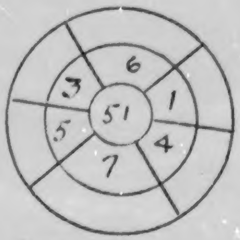
F. "Go to Jail": Designate a place in the room as the jail. Then write on the chalkboard a problem which meets the objective. Ask a student to write the answer. If the answer is incorrect the student "goes to jail".

G. "Blue and Gold Relay": Divide the group into two evenly matched teams. An extra child, the teacher, or one member of each team may be scorekeeper.

Use colors of chalk to match names of teams. You dictate a problem. Award 2 points for each correct answer.

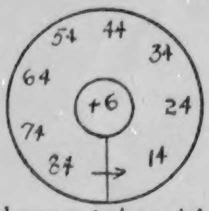
H. Use practice wheel with facts needed

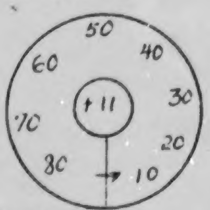




I. "Witch's House": (for small group) A house is made from a cardboard carton, putting in as many windows as possible but leaving a flap as a shutter for each window. A card with an arithmetic fact is pinned behind each flap. The answer should be on the back of the card. If the students answer correctly, the "witch" inside cannot get them. As they open the shutter they may say: "Open, open window wide, Look at what we find inside".

J. "Car Racing": The tracks are wheels as:





Each player takes his turn racing around a track. The player progresses by adding the number named in the center, to each other number. The player who names most numbers correctly and is finished first is the winner. The referee may have a "race-card" with correct answers to check the players.

V. Activities: continued

K. "Baseball": Home plate is at the front of the room. First, second, and third bases are around the room. The students form two teams. Each team has a player who acts as pitcher. The pitcher will "Pitch" questions such as 72 + 33. A player from the other team "Bats" the answer. If correct, he goes to first base. If wrong he is "out". When three players are "out" the other team comes up to bat.

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 95-98, 143-146, (35), 153-154, 157-167, (38), 267-268, 271-272, (54)
Houghton Mifflin(1972)	pp. 147-150, (35), 157-158, 161-171, (38), 193-194, 196, 273-276, (54)
Addison-Wesley(1971, 1968)	pp. 149-153, 155-160, 162

Book: 3

Houghton Mifflin(1967)	pp. 94-95
Houghton Mifflin(1972)	pp. 50-51, 54
Addison-Wesley(1971, 1968)	pp. 56, 57, Supp. Ex. Sets 8, 11, 12, pp. 58, 62

Book: 4

Houghton Mifflin(1972)	pp. 42-43

Level: 6 Step: A Concept: Subtraction

I. Concept:

Subtraction: Two or three place subtraction without renaming.

II. Behavioral Objective:

The student given a two or three-place addend and a sum will be able to name the missing addend.

III. Mathematical Ideas:

A. Subtraction is the inverse operation of addition.

B. The value of any digit is 10 times the value of the same digit on the right.

C. In a three-digit number the third place from the right is the hundreds' place and the second place from the right is the tens' place. The first place on the right is the ones' place.

D. Three-digit numerals are subtracted in pairs, the ones first, then the tens, then the hundreds and the results combined.

E. Subtraction is the renaming of a sum and addend as the missing addend.

F. Expanded notation for three-digit numerals involves expressing a number as the sum of its hundreds, tens and ones.

IV. Vocabulary to Stress:

addend
sum
hundreds
tens
ones
digit
equal
value
inverse
minus

V. Activities:

A. Adapt activities Level 6, Step A, Addition, pp. 1-3.

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 147-152, (36), 155-156, (37), 169-176, (39), 269-270, 273-274, (55)
Houghton Mifflin(1972)	pp. 152-154, (36), 159-160, (37), 173-182, (39), 193-194, 277-280, (55),
Addison-Wesley(1971, 1968)	pp. 165-167, (44), 169-170, 172, 174

Level: 6 Step: A Concept: Subtraction

Text References: continued

Book: 3

Houghton Mifflin(1967)	pp. 106-113, (26, 29, 30, 31, 32), 121
Houghton Mifflin(1972)	pp. 52-53, (16, 17), 55, 61, 67-70, (19, 20), 72-75
Addison-Wesley(1971, 1968)	pp. 60, (9, 11), Supp. Ex. Sets 14; 15, 16, 63

Book: 4

Houghton Mifflin(1967)	pp. 46
Houghton Mifflin(1972)	pp. 43

Level: 6 Step: A Concept: Multiplication

I. Concept:

Multiplication: Multiplying with 3 as a factor.

II. Behavioral Objective:

The student given a one-digit factor and 3 as the other factor will be able to rename them as a product.

III. Mathematical Ideas:

A. Multiplication is the number operation related to the joining of equivalent sets.

B. Multiplication is repeated addition of equal addends.

C. Multiplication is commutative.

D. Multiplication is the renaming of two factors as a product. One of the factors corresponds to the number of equivalent sets and the other factor to the cardinal number of each set. The product corresponds to the cardinal number of the union.

E. The horizontal (equation) form is the statement form. The vertical form is the computational form. The difference is in form only.

F. The symbol for multiplication is x.

IV. Vocabulary to Stress:

multiplication
times
factor
product
equal addends
equals
multiply

V. Activities:

A. Form arrays on flannel board.

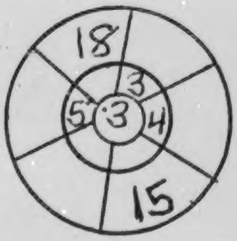
B. Use egg cartons to show factors in multiplication.

C. Ask student to find sets of objects in room to illustrate the objective.

D. Children may make up number stories involving multiplication with the factors being studied.

E. "I Am Thinking" - One student say, "I am thinking of a number multiplied by 3, the product is 18. What number am I thinking of?

F. The number wheel can be used. The factor 3 is in the center. The outer ring is for the product.



V. Activities: continued

G. Let's Play Games in Mathematics. Vol. 2, #4, 6, 9, 12, 15, 16, 20, 28, 32, 36, 78, 101.

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 301-305, (58)
Houghton Mifflin(1972)	pp. 303-306, (58), 307-308
Addison-Wesley(1971, 1968)	pp. 247, (67), 248, (68), 249, (69), 250, 254

Book: 3

Houghton Mifflin(1967)	pp. 132-133
Houghton Mifflin(1972)	pp. 126-129, (32-33)

Book: 4

Hougghton Mifflin(1972)	pp. 62-63

Other References:

Imperial Tapes (Primary) #24, 34

6-8

Level: 6 **Step:** A **Concept:** Multiplication

WORKSHEET

	X	3
1)	6	
2)	4	
3)	7	
4)	3	
5)	9	
6)	5	
7)	8	
8)	2	

9) 9 x 3 =

10) 2 x 3 =

11) 3 x 3 =

12) 3 x 7 =

13) 4 x 3 =

14) 3 x 8 =

15) 3 x 5 =

16) 6 x 3 =

Level: 6 Step: A Concept: Division

I. Concept:

Division: Division with 3 as a factor.

II. Beahvioral Objective:

The student given 3 as a factor and a product not greater than 27 will be able to name the one-digit missing factor.

III. Mathematical Ideas:

A. Division is the inverse of multiplication.

B. Division is the renaming of the product and one factor with a missing factor.

C. Division is separation of a set into equivalent subsets.

D. Division is repeated subtraction.

IV. Vocabulary to Stress:

- factor
- product
- division
- equal
- separating
- divided by (÷) (⟌)
- quotient

V. Activities:

A. Egg cartons can be used as arrays to show factors.

B. Let's Play Games in Mathematics. Vol. Three: #4, 13, 21, 62.

Text References:

Book: 3

Houghton Mifflin(1967)	pp. 130, 134
Houghton Mifflin(1972)	pp. 132-133

6-10

Level: 6 Step: A Concept: Measurement

I. Concept:

Measurement: Extending liquid measure to gallon.

II. Behavioral Objective:

The student given a measure expressed in a gallon, or half-gallon and a table of measures will be able to name the equivalent measure in smaller (quart, pint, cup) liquid measures.

III. Mathematical Ideas:

A. Cups, pints, quarts, half-gallon, and gallon are standard units of liquid measure.

B. Renaming liquid measure is one-to many matching.

IV. Voacbulary to Stress: gallon - half-gallon

V. Activities:

A. Fill in the blanks with the words quart, pint, half-gallon.

GALLON															
HALF-GALLON								HALF-GALLON							
QUART				QUART				QUART				QUART			
PINT		PINT		PINT		PINT		PINT		PINT		PINT		PINT	
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

B. Use gallon and half-gallon measures. Put food coloring in water to make it more interesting.

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 241
Houghton Mifflin(1972)	pp. 238
Addison-Wesley(1971, 1968)	pp. 285, (80)

Book: 3

Houghton Mifflin(1967, 1972)	pp. 175, 184
Addison-Wesley(1971, 1968)	pp. 184-185

Book: 4

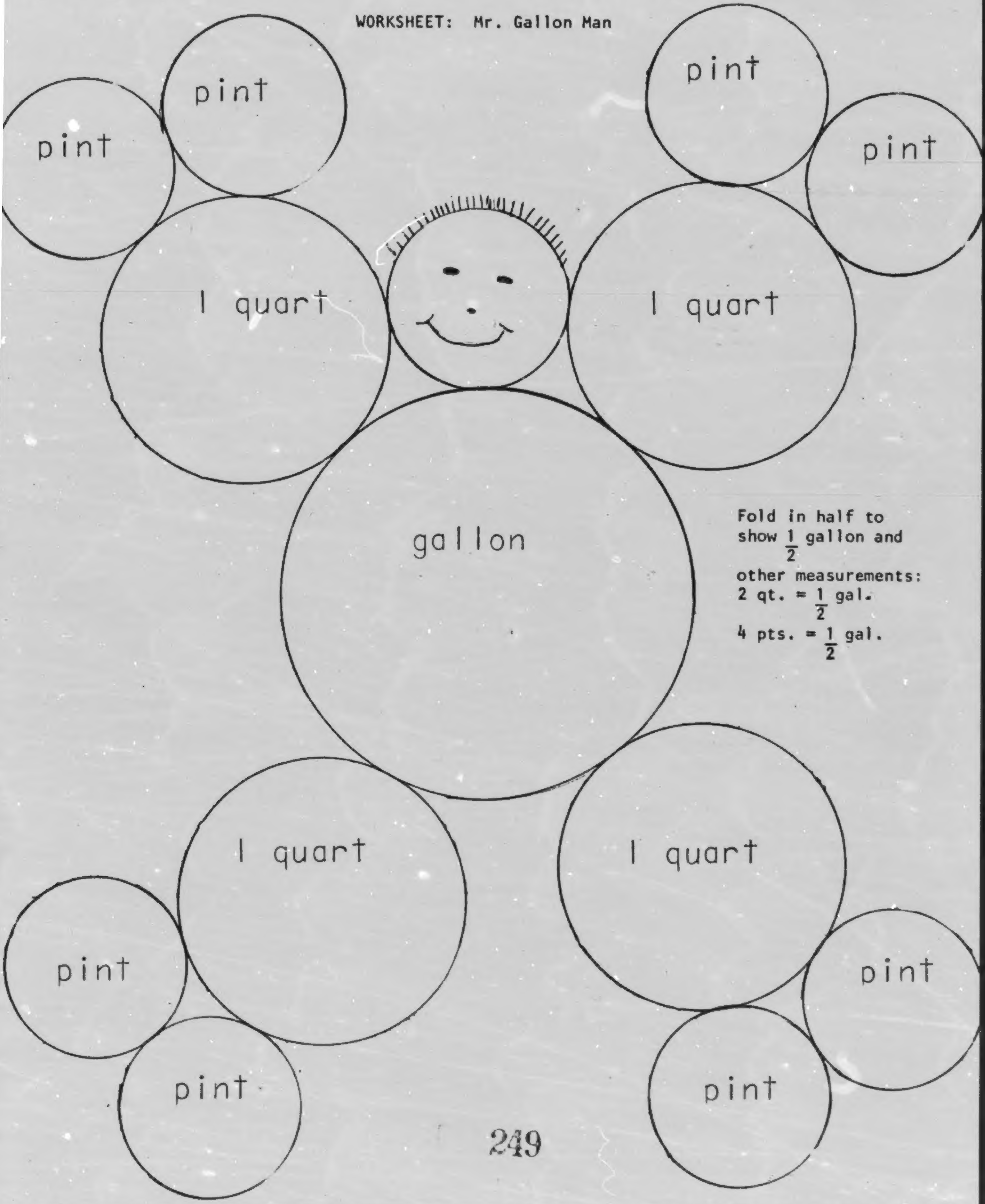
Addison-Wesley(1971, 1968)	pp. 128

Other References:

Imperial Tapes (Primary) #13
Franklin Series, Learning About Measurement, pp. 60-65.

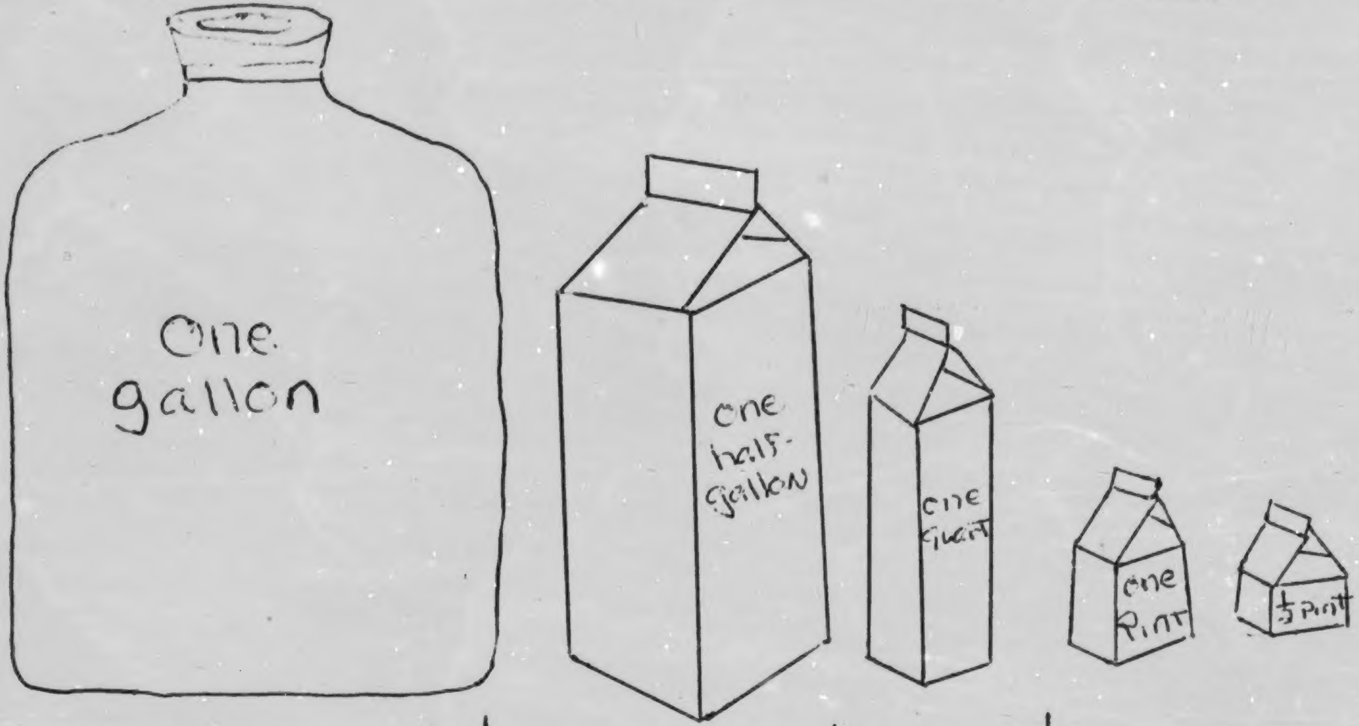
Level: 6 **Step:** A **Concept:** Measurement

WORKSHEET: Mr. Gallon Man


pint
pint
pint
pint
I quart
I quart
gallon
I quart
I quart
pint
pint
pint
pint

Fold in half to show $\frac{1}{2}$ gallon and other measurements:
2 qt. = $\frac{1}{2}$ gal.
4 pts. = $\frac{1}{2}$ gal.

Level: 6 **Step:** A **Concept:** Measurement


One gallon
one half-gallon
one quart
one pint
½ pint

1 gallon	half-gallon	1 quart	1 pint	½ pint
2 half-gallons	2 quarts	2 pints	2 cups	1 cup
4 quarts				

Fill in the blanks.

1. One pint makes______cup(s).

2. One-half pint makes______cup(s).

3. One quart makes______pint(s).

4. One gallon makes______quart(s).

5. Two half-gallons make ______gallon(s).

6. Two gallons make______half-gallon(s).

Level: 6 Step: B Concept: Numeral

I. Concept:

Numeral: Recognizing fractional areas of a region or set.

II. Behavioral Objective:

The student given regions or sets separated into three or four equal parts will be able to recognize and name $\frac{3}{4}$, $\frac{1}{3}$, or $\frac{2}{3}$ of the region.

III. Mathematical Ideas:

A. $\frac{3}{4}$, $\frac{1}{3}$, and $\frac{2}{3}$ are numerals that name fractional numbers.

B. If a region is separated into four parts of the same size, three of the parts are $\frac{3}{4}$ of the original region.

C. If a region is separated into three parts the same size, one of the parts is $\frac{1}{3}$ of the original region.

D. If a region is separated into three parts of the same size, two of the parts are $\frac{2}{3}$ of the original region.

IV. Vocabulary to Stress:

region
fractional number
equivalent
three fourths
one third
two thirds

V. Activities:

A. Fold a sheet of colored construction paper in half. Ask how many parts there will be if you cut along the fold. Cover half of the sheet with a piece of white paper and ask what part of the red sheet is covered and what part is not covered. Fold or have the children cut the paper into fourths and have students show $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$. As the students name each part, you write the numerals "$\frac{1}{4}$" and "one fourth" etc. on the chalkboard.

Stress the meaning of the 1 and 4 in the numeral $\frac{1}{4}$ and 3 and 4 in $\frac{3}{4}$.

B. Use the flannel board or bulletin board for simple arrangements. Use yarn to indicate $\frac{3}{4}$, $\frac{1}{3}$, $\frac{2}{3}$.

C. Have the children separate movable objects in the room into equivalent sets.

D. Children may use magazines to find objects in multiples of four or three. These can be cut out and pasted on colored paper. Then students could ring three fourths, one third, or two thirds using black crayon.

Level: 6 Step: B Concept: Numeral

V. Activities: continued

E. Use egg cartons and colored yarn to show $\frac{1}{3}$, $\frac{2}{3}$, and $\frac{3}{4}$.

F. Use children as the set. Describe $\frac{2}{3}$ of the group. Ask, "How many thirds have on tennis shoes?"

G. Cut paper plates into fractional parts and label each part. Put together as a puzzle.

H. Draw six triangles on the board. Ask a child to put an x in $\frac{1}{3}$ of them.

I. Draw four circles on the board and underline $\frac{3}{4}$ of them.

J. Let's Play Games in Mathematics: Volume Two # 41, 60, 88
Volume Three #6, 21, 25, 56, 58, 60, 70

Text References:

Book: 1

Addison-Wesley(1971, 1968)	pp. 279-280, (79)

Book: 2

Houghton Mifflin(1967)	pp. 239-240, 243-248, (47)
Houghton Mifflin(1972)	pp. 235-236, 241-244, (47), 251
Addison-Wesley(1971, 1968)	pp. 276, 279, 280, (78)

Book: 3

Houghton Mifflin(1967)	pp. 160, 163, 168-169, 294-295

Other References:

Imperial Tapes (Primary) #20, 21

Level: 6 Step: B Concept: Order

I. Concept:

Order: Associating half units with points on a number line.

II. Behavioral Objective:

The student given a line segment separated into equal segments will be able to name the points by half units.

III. Mathematical Ideas:

A. Fractional numbers can be assigned to points on the number line.

B. Every number has many names.

C. A fraction is a numeral that names a fractional number.

IV. Vocabulary to Stress:

one-half	fraction
line segment	points

V. Activities:

A. Counting by one-half using the number line.

B. Have each student draw a line segment two inches long and mark the end of each inch line segment with a dot. Have them write 0 under the beginning of the line segment (on the left) and 2 under the end of it. Have them mark the middle point with 1. Then have them mark the halfway points between the whole numbers. Ask them which numerals can be written at these points. $\left(\frac{1}{2}, \frac{3}{2}\right)$

Have them write in these fractions above the line segment as well as $\frac{2}{2}$ and $\frac{4}{2}$.

C. Write fractions on cards: $\frac{0}{2}$ $\frac{1}{2}$ $\frac{2}{2}$ $\frac{3}{2}$ $\frac{4}{2}$

Mix them up and ask a student to place them on chalkboard tray in order from smallest to largest.

D. Let's Play Games in Mathematics. Vol. Two, #62.

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 81-83, 91-92
Houghton Mifflin(1972)	pp. 79-81

6-16

Name: ____________________

Level: 6 Step: B Concept: Order

WORKSHEET

Fill in the blank.

1. 0 ____ 1 ____ ____ $2\frac{1}{2}$ 3 ____ 4 ____ ____ ____ 6 ____ 7

2. ____ $\frac{1}{2}$ ____ $1\frac{1}{2}$ ____ ____ 3 ____ ____ $4\frac{1}{2}$ ____ ____ ____ ____ ____

3. 6 ____ 7 ____ ____ $8\frac{1}{2}$ ____ ____ 10 $10\frac{1}{2}$ ____ ____ ____ ____ ____

4. ____ ____ ____ 6 ____ ____ ____ ____ ____ ____ $9\frac{1}{2}$ ____ ____ ____ ____

5. ____ ____ 1 ____ ____ ____ ____ $3\frac{1}{2}$ ____ ____ ____ ____ ____ $6\frac{1}{2}$ ____

6. 4 ____ ____ $5\frac{1}{2}$ ____ ____ 7 ____ ____ ____ ____ ____ ____ ____ ____

7. 0 ____ 1 ____ ____ ____ ____ ____ ____ $4\frac{1}{2}$ ____ ____ ____ ____ ____

Level: 6 Step: B Concept: Addition

I. Concept:

Addition: Adding 2 or 3 two digit addends involving renaming.

II. Behavioral Objective:

The student given 2 or 3 two digit addends which require renaming will be able to name the sum.

III. Mathematical Ideas:

A. Addition is commutative.

B. The value of any digit is 10 times the value of the same digit to the right.

C. Expanded notation for two-digit numerals involves expressing a number as the sum of its tens and ones. Ex. 18 = 10 + 8

D. The second place from the right is the tens' place and the first place on the right is the ones' place.

E. Two-digit numerals are added in pairs: the ones first, then tens, and then the results combined.

F. Addition is associative, the way in which the addends are grouped does not affect the sum. Parentheses are used to indicate the grouping.

G. Zero is the identity element for addition.

IV. Vocabulary to Stress:

addends
renaming
regrouping
parentheses
ones
tens
sum
plus
equals

V. Activities:

A. Use pegboard. Can use golf tees. 9 pegs in ones, tens and hundreds. Ask children what to do when ones are filled.

B. Adapt activities Level 6, Step A, pp. 1-3.

C. Let's Play Games in Mathematics. Vol. 2, #6, 15, 17, 35

6-18

Level: 6 Step: B Concept: Addition

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 177-181, 201, (40), 202-206, (41), 207-209, (42), 210, (43), 212, 215-216, (45), 234, 292
Houghton Mifflin(1972)	pp. 183-186, (40), 195, 199-206, (41, 42, 43), 208
Addison-Wesley(1972, 1968)	pp. 211-213, (55), 214-215, (56), 216, 218, (57), 220

Book: 3

Houghton Mifflin(1967)	pp. 98-99, (28, 29), 114-117, (33)
Houghton Mifflin(1972)	pp. 81-83, 113, 207-208, 216, 221, 241
Addison-Wesley(1971, 1968)	pp. 54, (6), 55, (7, 12, 14, 27, 28, 29) Addition & Subtraction: 95, 150-151, 187, 303, 305, 309-310

Book: 4

Houghton Mifflin(1972)	pp. 44-45, Supp. Ex. 336
Addison-Wesley(1971, 1968)	pp. 34-38, #1, Supp. Ex. 324 Set 10

Other References:

Imperial Tape (Primary) #24, 25
Coundown--Lesson 24, 25

Level: 6 **Step:** B **Concept:** Subtraction

I. Concept:

Subtraction: Subtracting two-digit numerals which require renaming.

II. Behavioral Objective:

The student given a two-digit addend and a sum which require renaming will be able to name the missing addend.

III. Mathematical Ideas:

A. Subtraction is the renaming of a sum and an addend as the missing addend by expanded notations:

$$\begin{array}{rcr} 30 & = & 20 + 10 \\ -14 & = & -10 - \ \ 4 \\ \hline & & 10 + 66 \end{array} = \boxed{}$$

B. Two-digit numerals are subtracted in pairs, the ones, the tens, and the results combined.

C. The value of any digit is 10 times the value of the same digit to the right.

D. Subtraction is the inverse operation of addition.

E. The second place from the right is the tens' place and the first place on the right is the ones' place.

IV. Vocabulary to Stress: addend - sum - rename - minus - regroup

V. Activities:

A. Adapt activities Level 6, Step A, pp. 1-3.

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 249-252, (48), 253-255, (49), 256-259, (50), 260, (51, 52), 261, 277, 279
Houghton Mifflin(1972)	pp. 253-260, (48, 49), 263-267, (50, 51, 52), 283
Addison-Wesley(1971, 1968)	pp. 221-222, 225-228, (60), 230, (61), 232, (62), 234, (63), 236, (64)

Book: 3

Houghton Mifflin(1967)	pp. 100-101, (28), 118-120, (34)
Houghton Mifflin(1972)	pp. 85-86, 113, 173, 226-228
Addison-Wesley(1971, 1968)	pp. 71, (17), 73, (19)

Book: 4

Addison-Wesley(1971, 1968)	pp. 49, Supp. Ex. 327 Set 18

Other References:

Imperial Tape (Primary) #32, 33, 34
Countdown--Lesson 32, 33, 34

6-20

Level: 6 Step: B Concept: Multiplication

I. Concept:

Multiplication: Multiplying with 4 as a factor.

II. Behavioral Objective:

The student given a one-digit factor and 4 as the other factor will be able to rename them as a product.

III. Mathematical Ideas:

A. Multiplication is the number operation related to the joining of equivalent sets.

B. Multiplication is repeated addition of equal addends.

C. Multiplication is commutative.

D. Multiplication is the renaming of two factors as a product. One of the factors corresponds to the number of equivalent sets and the other factor to the cardinal number of each set. The product corresponds to the cardinal number of the union.

E. The horizontal (equation) form is the statement form. The vertical form is the computational form. The difference is in form only.
F. The symbol for multiplication is x.

IV. Vocabulary to Stress:
multiplication
times
factor
product
equal addends
equals
multiply

V. Activities:

A. Use array.

B. Let's Play Games in Mathematics. Vol. Two, #4, 6, 9, 15, 16, 20, 28, 32, 36

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 311-318, (59, 60)
Houghton Mifflin(1972)	pp. (57), 307-308, (59, 60), 313-316
Addison-Wesley(1971, 1968)	pp. 251, (70, 71), 252, (72), 254, (74), 258, 260

Book: 3

Houghton Mifflin(1967)	pp. 136-137
Houghton Mifflin(1972)	pp. 136-137
Addison-Wesley(1972, 1968)	pp. 84-89, 93, 106-109, 111

Book: 4

Addison-Wesley(1971, 1968)	pp. 72, 84

Other References:

Imperial Tape (Primary) #24, 24

Level: 6 **Step:** B **Concept:** Multiplication

WORKSHEET

Name____________________

Fill the blanks.

	X	2
1.	2	
2.	8	
3.	5	
4.	9	
5.	3	
6.	7	
7.	4	
8.	6	

	X	5
9.	7	
10.	3	
11.	9	
12.	5	
13.	6	
14.	4	
15.	8	
16.	2	

6-22

Level: 6 Step: B Concept: Multiplication

WORKSHEET

Name________________

Fill the blanks.

	X	3
1.	6	
2.	4	
3.	7	
4.	3	
5.	9	
6.	5	
7.	8	
8.	2	

	X	4
9.	2	
10.	8	
11.	4	
12.	6	
13.	5	
14.	9	
15.	3	
16.	7	

Level: 6 Step: B Concept: Division

I. Concept:

Division: Division with 4 as a factor.

II. Behavioral Objective:

The student given 4 as a factor and a product not greater than 36 will be able to name the one-digit missing factor.

III. Mathematical Ideas:

A. Division is the inverse of multiplication.

B. Division is the renaming of the product and one factor with a missing factor.

C. Division is separation of a set into equivalent subsets.

D. Division is repeated subtraction.

IV. Vocabulary to Stress:

factor
product
division
equal
separating
divided by ( ) ( )‾‾‾)
quotient

V. Activities:

* A. Egg cartons can be used as arrays to show factors. Children can cut egg carton to find factor.

B. Let's Play Games in Mathematics. Vol. Three, #4, 13, 21, 62.

Text References:

Book: 3

Houghton Mifflin(1967)	pp. 138, 143-145, (39), 146-149
Houghton Mifflin(1972)	pp. 138
Addison-Wesley(1971, 1968)	pp. 136-138, 144, 149

Other References:

Imperial Tape (Primary) #29
Countdown--Tapes and Lessons 45-50

6-24

Level: 6 Step: B Concept: Measurement

I. Concept:

Measurement: Counting money to $1.00.

II. Behavioral Objective:

The student given a set of coins consisting of pennies, nickels, dimes, quarters, or half dollars will be able to name the value of the set not exceeding $1.00.

III. Mathematical Ideas:

A. Coins have specific values in terms of a basic unit of monetary value.

B. A penny has the value of one cent, a nickel five cents, a dime ten cents, a quarter twenty five cents, and a half dollar fifty cents.

C. The combined value of a set of coins is found by adding the value of the members of the set.

IV. Vocabulary to Stress:

coin
dime
sum
penny
quarter
value
nickel
half dollar
count

V. Activities:

A. Let's Play Games in Mathematics. Vol. Three, #44.

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 192-194, 196, 211
Houghton Mifflin(1972)	pp. 59, (12), 139, (30), 209-213
Addison-Wesley(1971, 1968)	pp. 271-273, (75, 76)

Book: 3

Houghton Mifflin(1967)	pp. 16
Addison-Wesley(1971, 1968)	pp. 52-53

Other References:

Imperial Tape (Primary) #37, 38
Franklin Series, Learning About Measurement, pp. 94-101

Level: 6 Step: C Concept: Numeral

I. Concept:

Numeral: Properties of 0 and 1.

II. Behavioral Objective:

The student given zero and any number can name the sum or produt.
The student given one and any number can name the product.

III. Mathematical Ideas:

A. The sum of any number and zero is that number.

B. Zero is called the identity element for addition.

C. When zero is a factor the product is zero.

D. When one is a factor the product is the same as the other factor.

E. One is called the identity element for multiplication.

IV. Vocabulary to Stress:

zero	sum	product

V. Activities:

A. Let's Play Games in Mathematics. Vol. 2, Adapt # 35, 71, 81, 84, 98, 99.

Text References:

Book: 1

Houghton Mifflin(1967)	pp. 309-310, (60)

Book: 2

Houghton Mifflin(1967)	pp. 309-310
Houghton Mifflin(1972)	pp. 310

Book: 3

Houghton Mifflin(1967)	pp. 145
Houghton Mifflin(1972)	pp. 147
Addison-Wesley(1971, 1968)	pp. 96-97

Level: 6 Step: C Concept: Addition & Subtraction

I. Concept:

Addition and Subtraction: Solving word problems involving renaming two-digit numerals with two or more addends.

II. Behavioral Objective:

The student given a word problem with two-digit numerals with two or more addends or with a sum and one addend will be able to write and solve the problem.

III. Mathematical Ideas:

A. Mathematical thinking involves identifying the sets and distinguishing between joining and separating sets.

B. An equation is a statement about numbers. (The numbers may be associated with sets that are involved in word problems.)

C. Word problems require finding another name for the cardinal number of the sets in the problem.

IV. Vocabulary to Stress:

addends
sum
equation
renaming
regroup

V. Activities:

A. Teacher read problems involving renaming of numbers.

B. Have children make up word problems from their own experiences.

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 182, 262, (44), (53)
Houghton Mifflin(1972)	pp. 187, 197, 215, (44), 261-262, 268, 281, (53) 284, 296
Addison-Wesley(1971, 1968)	pp. 217, 219, (58), 231, (61-62), 233, 235

Book: 3

Houghton Mifflin(1972)	pp. 57
Addison-Wesley(1971, 1968)	pp. 59, 64-65, 70, 74-75, 79, (15, 20)

Level: 6   Step: C   Concept: Addition & Subtraction

Activities: (A)

Problems teacher may read to class.

1. It was Joan's birthday. She decided to buy a small cherry pie for 29¢. She gave the clerk 35¢. There was no tax. How much change did Joan get?

2. George had 83¢. He wants to buy a baseball. It costs 69¢. There is no tax. How much will George have left if he buys the baseball?

3. Sam went fishing with 3 other boys. Sam's mother gave each of the four boys 9 small pies. How many pies did the boys have in all?

4. Mary sews doll dresses. She sells them to her friends for 35¢ each. She pays 8¢ for material to make each doll dress. How much money does Mary have left for herself after selling a doll dress?

5. Brad and Tad collect tadpoles. They now have 42 tadpoles. Brad has 18 of these tadpoles in his pail. How many tadpoles are in Tad's pail?

6. Dick and Jerry are going on a hike. Dick and Jerry are big eaters. Dick makes 16 jelly sandwiches for himself. Jerry makes 29 banana sandwiches for himself. How many sandwiches will both boys take on their hike providing they don't eat any before they start?

7. The children at Davis school are helping to sell tickets for the school play. The children in third grade sold 89 tickets. The children in fourth grade sold 67 tickets. How many tickets did both classes sell?

8. Frank and Lee are buying tootsie rolls. Frank wants 16. Lee wants 19. If tootsie rolls cost 2 each, then how much would both boys spend on tootsie rolls altogether?

9. Polly the Parrot ate 17 of her 25 crackers. How many crackers were left?

Level: 6 Step: C Concept: Multiplication

I. Concept:

Multiplication: Solving word problems involving multiplication with 2, 3, 4, or 5 as a factor.

II. Behavioral Objective:

The student given a word problem using a one digit factor and 2, 3, 4, or 5 as the other factor will be able to determine the operation and solve the problem.

III. Mathematical Ideas:

A. Multiplication is the number operation corresponding to the joining of equivalent sets.

B. Multiplication is a short method of adding equal addends.

C. Multiplication is the renaming of two factors as a product.

D. A one-to-many matching between two sets may be described as rate. Rates are used in solving verbal problems involving multiplication.

E. Mathematical thinking involves identifying.

IV. Vocabulary to Stress:

equation multiply factor product

V. Activities:

A. Teacher read problems involving multiplication with 2, 3, 4, or 5 as a factor.

B. Have children make up word problems from their own experiences.

Text References:

Book: 2

Houghton Mifflin(1967)	pp. 300
Houghton Mifflin(1972)	pp. 295; 309
Addison-Wesley(1971, 1968)	pp. 259, 262, 265-266, (73)

Book: 3

Houghton Mifflin(1967)	pp. 144, 149
Houghton Mifflin(1972)	pp. 138

Level: 6 Step: C Concept: Multiplication

Activities: (A) Problems teacher may read to class.

1. Bob and his father went turkey hunting for 5 days. Each day they killed 5 wild turkeys. How many turkeys did they kill?

2. If each of 5 clowns has 7 balloons in his hand how many balloons do all the clowns have?

3. Mike played piano for 5 days. If he played 9 minutes each day, how many minutes did he play piano?

4. Terri gave a pack of gum to each of 5 friends. There were 8 sticks of gum in each pack. How many sticks of gum did she have?

5. John is running 4 miles a day. How many miles would he run in 9 days?

6. Sally bought 4 cans of dog food for each day for 8 days. How many cans of dog food did she buy?

7. Donna planted 4 rows of corn with 7 seeds in each row. How many corn seeds did she plant?

8. Mary has 5 boxes of pencils with 6 pencils in each box. How many pencils does Mary Have?

9. Joe worked 3 days for 8 hours a day. How many hours did he work?

10. Bill helped his father mow their yard. They worked 6 hours for 4 days. How many hours did they mow the yard?

Level: 6 Step: C Concept: Division

I. Concept:

Division: Solving word problems unvolving division with 2, 3, 4, or 5 as a factor.

II. Behavioral Objective:

The student given a word problem involving a product 45 or less and 2, 3, 4, or 5 as a factor will be able to determine the operation and solve the problem.

III. Mathematical Ideas:

A. Division may be interpreted as successive subtraction of the same addend.

B. Multiplying and dividing by the same number are oposite operations.

IV. Vocabulary to Stress:

factor
product
division
equal
divided by

V. Activities:

A. Teacher read problems involving division with 2, 3, 4, or 5 as a factor.

B. Have children make up problems from their own experiences.

Text References:

Book: 3

Addison-Wesley(1971, 1968) pp. 139, 143, 154-155, 157-159

Level: 6 Step: C Concept: Division

WORKSHEET

Activities: (A) Problems teacher may read to class.

1. Mary picked 15 roses to give to each of her 3 friends. How many roses did each friend get?

2. Bill has 45 marbles. He wants to put them into 5 bags. How many marbles can he put in each bag?

3. John has 36 football cards. He wants to give them to his 4 friends. How many football cards would each friend get?

4. Nancy's mother baked 27 cookies and put them into 3 rows. How many cookies did she put in each row?

5. There are 40 birds sitting on 5 trees. How many birds are on each tree?

6. There are 35 books on 7 shelves. How many books are on each shelf?

7. Mother gave 30 pieces of candy to her 6 children. How many pieces of candy did each child get?

8. Sue read 28 pages of her book in 4 days. How many pages did she read each day?

9. Patty wrote 12 letters in 3 days. How many letters did she write each day?

10. Mother bought 16 gold fish and put them into 4 bowls. How many gold fish did she put in each bowl?

Level: 6 Step: C Concept: Measurement

I. Concept:

Measurement: Making change to $1.00.

II. Behavioral Objective:

The student given the cost of an item less than $1.00 and a set of coins, half dollar, quarter, dime, nickel, and penny will be able to make correct change.

III. Mathematical Ideas:

A. The terms penny, nickel, dime, quarter and half dollar refer to the coins.

B. The value of the coin is expressed in cents.

C. Making change involves the additive method by counting from the sum paid to the value of the coins offered in exchange.

IV. Vocabulary to Stress:

coin
value
making change
count
sum
penny
nickel
dime
quarter
half dollar

V. Activities:

A. Let's Play Games in Mathematics. Vol. One: #.63, 84, 85, 89
Vol. Two: # 73, 81
Adapt each game to meet the needs of the concept to be taught.

Text References:

Book: 1

Houghton Mifflin(1967)	pp. 274
Houghton Mifflin(1972)	pp. 233, 253-254

Book: 2

Houghton Mifflin(1972)	pp. 238
Addison-Wesley(1971, 1968)	pp. 270, 274

Level: 6

WORKSHEET ANSWERS

Page 6-8

1. 18
2. 12
3. 21
4. 9
5. 27
6. 15
7. 24
8. 6
9. 27
10. 6
11. 9
12. 21
13. 12
14. 24
15. 15
16. 18

Page 6-12

1. 2
2. 1
3. 2
4. 4
5. 1
6. 4

Page 6-16

1. $\frac{1}{2}$ $1\frac{1}{2}$ 2 $3\frac{1}{2}$ $4\frac{1}{2}$ 5 $5\frac{1}{2}$ $6\frac{1}{2}$

2. 0 1 2 $2\frac{1}{2}$ $3\frac{1}{2}$ 4 5 $5\frac{1}{2}$ 6 $6\frac{1}{2}$ 7

3. $6\frac{1}{2}$ $7\frac{1}{2}$ 8 9 $9\frac{1}{2}$ 11 $11\frac{1}{2}$ 12 $12\frac{1}{2}$ 13

4. $4\frac{1}{2}$ 5 $5\frac{1}{2}$ $6\frac{1}{2}$ 7 $7\frac{1}{2}$ 8 $8\frac{1}{2}$ 9 10 $10\frac{1}{2}$ 11 $11\frac{1}{2}$

5. 0 $\frac{1}{2}$ $1\frac{1}{2}$ 2 $2\frac{1}{2}$ 3 4 $4\frac{1}{2}$ 5 $5\frac{1}{2}$ 6 7

6. $4\frac{1}{2}$ 5 6 $6\frac{1}{2}$ $7\frac{1}{2}$ 8 $8\frac{1}{2}$ 9 $9\frac{1}{2}$ 10 $10\frac{1}{2}$ 11

7. $\frac{1}{2}$ $1\frac{1}{2}$ 2 $2\frac{1}{2}$ 3 $3\frac{1}{2}$ 4 5 $5\frac{1}{2}$ 6 $6\frac{1}{2}$ 7

Page 6-21

1. 4
2. 16
3. 10
4. 18
5. 6
6. 14
7. 8
8. 12
9. 35
10. 15
11. 45
12. 25
13. 30
14. 20
15. 40
16. 10

Page 6-22

1. 18
2. 12
3. 21
4. 9
5. 27
6. 15
7. 24
8. 6
9. 8
10. 32
11. 16
12. 24
13. 20
14. 36
15. 12
16. 28

Level: 6

ANSWERS TO WORKSHEETS

6-27

1. 6¢
2. 14¢
3. 36
4. 27¢
5. 24
6. 45
7. 156
8. 70¢
9. 8

6-29

1. 25
2. 35
3. 45
4. 40
5. 36
6. 32
7. 28
8. 30
9. 24
10. 24

6-31

1. 5
2. 9
3. 9
4. 9
5. 8
6. 5
7. 5
8. 7
9. 4
10. 4

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I. Concept:

Sets: Using the commutative principle with addition.

II. Behavioral Objective:

The student given addition problems will be able to solve equations which require the use of the commutative principle.

III. Mathematical Ideas:

A. Addition is commutative. Subtraction is not commutative.

B. The order of the addends, when joining sets, does not affect the sum.

IV. Vocabulary to Stress:

order commutative order rule

V. Activities:

*A. Use felt cutouts on the flannel board to demonstrate the order principle. Put a set of 3 objects and a set of 4 objects on the flannel board. Then reverse the order of the two sets on the flannel board. Write the equation on the chalkboard to represent what you have done $3 + 4 = 4 + 3$.

B. Let's Play Games in Mathematics, Vol. 2, #11, 13, 15, 19, 21, 35, 52, 71, 84, 92, 98.

C. Use 3 x 5 cards to make a matching game for showing the commutative property of addition. The child has to match cards such as $\boxed{3 + 4}$ and $\boxed{4 + 3}$. A deck can consist of 20 (2 players) or 40 (4 players) cards depending on how many children are going to play. Four cards should be dealt to each player. The object of the game is to match pairs of cards until someone has two matching pairs. After each player is dealt 4 cards, the remaining cards are placed face down in a pile except for one card which is the first card in a pile that is face up. The first player can pick up either the face-up card or the top card that is face down. He then has to discard one of his cards. He places it on the face-up pile. Play continues until a player has two matching pairs in his hand.

Text References:

Book: 3

Houghton Mifflin (1972) pp. 30-31, (7).
Addison-Wesley(1971,1968) pp. 30, 32-33.

Book: 4

Houghton Mifflin (1972) pp. 31
Addison-Wesley(1971,1968) pp. 30-33, 79-81.

* Suggested Introductory Activity

I. Concept:

Numeral: Naming place value to thousands.

II. Behavioral Objective:

The student given any four-digit numeral will be able to name the place value of each digit.

III. Mathematical Ideas:

A. Ten is the base of our number system.

B. A digit in any place has ten times the value of the digit to its right.

C. The fourth digit from the right represents the thousands' place.

D. A digit in our place value system has three meanings: Place value, face value, and total value. For example, the 5 in 547 has the place value of hundreds, the face value of 5, and the total value of 500.

E. An expanded numeral names a number as the sum of the total value of its digits.

IV. Vocabulary To Stress:

thousand
digit
abacus
expanded numeral
short form
column

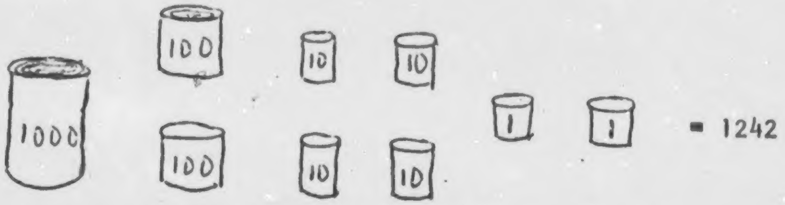
V. Activities:

A. The teacher can dictate numbers to thousands to give children practice in reading and writing four-digit numerals. The child should also be able to give the place value of each digit.

B. Let's Play Games in Mathematics, Vol. 2, Games #35, 70, 71, 76, 77.

C. Let's Play Games in Mathematics, Vol. 3, Games #2, 15, 26, 35, 52, 77.

*D. Paper bags or tin cans can also be used to represent place value through thousands. See example:



AWT. E. pp. 9, 11

Level: 7 Step: A Concept: Numeral 7-3

NOTE: The pages suggested below often include both place value and order (7A order). They may be taught at the same time.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 24-25, (8).
Houghton Mifflin (1972) pp. 20-21, (7), 22.
Addison-Wesley(1971,1968) pp. 10-11.

Book: 4

Houghton Mifflin (1967) pp. 13-16, (4).
Houghton Mifflin (1972) pp. 7, (2), 16-18, (5).
Addison-Wesley(1971,1968) pp. 5-9, (2); Supp. Ex. 2, 3.

Book: 5

Houghton Mifflin (1967) pp. 16-18, (5)
Houghton Mifflin (1972) pp. 14, 15, 20, 21.
Addison-Wesley T. Ed. T10-T11.
(1971,1968)

* Suggested Introductory Activity

Level: 7
Step: A

WORKSHEET: NUMERALS

WRITE THESE NUMERALS IN EXPANDED FORM.

1. 2143 ______
2. 5575 ______
3. 4927 ______
4. 3860 ______
5. 9988 ______

WRITE THESE NUMERALS IN THE SHORT FORM.

6. 1000 + 700 + 60 + 5 ______
7. 9000 + 900 + 90 + 9 ______
8. 4000 + 800 + 30 + 1 ______
9. 8000 + 200 + 30 + 0 ______
10. 5000 + 100 + 20 + 2 ______

WHICH DIGIT IS IN THE THOUSANDS' PLACE?

11. 1621 ______
12. 9725 ______
13. 4823 ______
14. 2948 ______
15. 3195 ______
16. 6083 ______
17. 7498 ______
18. 9215 ______
19. 3956 ______
20. 7582 ______

WHICH DIGIT IS IN THE HUNDREDS' PLACE

21. 3471 ______
22. 4035 ______
23. 1950 ______
24. 2693 ______
25. 7582 ______
26. 7450 ______
27. 1239 ______
28. 8341 ______
29. 4156 ______
30. 9485 ______

I. Concept:

Order: Using the symbols for greater than, less than, and equal to, (> , < , =) with four-digit numbers.

II. Behavioral Objective

The student given two numbers between 0 - 9,999 will be able to use the sumbols > , < , = to make true number sentences.

III. Mathematical Ideas:

A. On a number line the number to the right is greater. The number to the left is less.

B. The symbol for "greater than" is " > ".

C. The symbol for "less than" is " < ".

D. The symbol for "is equal to" is " = ".

E. The symbol for "is not equal to" is " ≠ ".

IV. Vocabulary To Stress:

greater than
less than
between
equal
is not equal to

V. Activities:

*A. Skipping: Understanding concept of patterns of number sequence. The teacher explains to the children that they have already learned some patterns of number sequence as
1, 2, 3 ...
2, 4, 6 ... where children have learned to supply the missing terms.

Now, we will do skip-counting patterns, by 10's, starting with 800.

800, 810, 820, 830 . . .

by 100's starting with 100

100, 200, 300, 400 . . .

B. Let's Play Games in Mathematics, Vol. 3, Games #5, 26, 46, 77.

7-6 Level: 7 Step: A Concept: Order

Text References:

Book: 3

Houghton Mifflin (1967) pp. 19, (31-42), 21, (33-44), 25.
Houghton Mifflin (1972) pp. 20-21, (6), 22, Extra Practice p. 318.
Addison-Wesley(1971,1968) pp. 11-13.

Book: 4

Houghton Mifflin (1967) p. 10-11, 15
Houghton Mifflin (1972) pp. 8, 9, 15, 18-19, (5).

Book: 5

Houghton Mifflin (1967) pp. 145, 14, 15.
Houghton Mifflin (1972) pp. 7, 239.

* Suggested Introductory Activity

Level: 7
Step: A

WORKSHEET: ORDER

WRITE THE NUMBER THAT COMES BEFORE AND AFTER:

1. 897 898 899
2. ________ 1460 ________
3. ________ 8752 ________
4. ________ 4336 ________
5. ________ 9159 ________
6. ________ 2036 ________
7. ________ 1000 ________
8. ________ 3460 ________
9. ________ 5872 ________
10. ________ 4040 ________
11. ________ 787 ________
12. ________ 8001 ________
13. ________ 6852 ________
14. ________ 1256 ________
15. ________ 2458 ________

READ EACH NUMBER SENTENCE. WRITE T IF IT IS TRUE; WRITE F IF IT IS FALSE.

16. 9 > 7 ________
17. 45 > 42 ________
18. 19 = 91 ________
19. 450 < 430 ________
20. 620 < 627 ________
21. 5250 > 5000 ________
22. 6917 = 6917 ________
23. 172 > 721 ________
24. 5648 > 5628 ________
25. 90 < 91 ________

WRITE " > ", " < ", or " = " TO COMPLETE THE ______.

26. 456 ______ 486
27. 530 ______ 530
28. 6791 ____ 6761
29. 1500 ____ 1200
30. 47 _______ 46
31. 47 _______ 49
32. 498 ______ 830
33. 78 _______ 72
34. 5680 ____ 5670
35. 3198 ____ 2579

7-8 Level: 7 Step: A Concept: Addition

I. Concept:

Addition: Adding three-digit numerals involving renaming.

II. Behavioral Objective:

The student given 2 three-digit addends which require renaming will be able to name the sum.

III. Mathematical Ideas:

A. In a three-digit numeral, the third digit from the right is in the hundreds' place, and the second digit is in the tens' place, and the first digit is in the ones' place.

B. Any digit is 10 times the value of the digit on the right.

C. Addition is the renaming of addends as a sum.

D. Addition and subtraction are inverse operations.

E. Addition is the joining of sets.

IV. Vocabulary To Stress:

plus
addend
sum
inverse
hundred

V. Activities:

A. If the children need more work on basic facts of addition, timed quizzes could be given. Refer to Addison-Wesley Book 3, Supplementary Exercises, Set 1 and Set 2.

B. Let's Play Games in Mathematics, Vol. 3, Games #40, 43, 45, 55, 59, 63, 64, 65, 68, 69, 77.

C. Give the children a worksheet that has common mistakes made by children such as

$$\begin{array}{r} 964 \\ +523 \\ \hline 1387 \end{array}$$

Challenge the children to correct the answers.

D. For further review on basic addition facts use any of the following materials:

1) Smarty (commercial game)

2) Bingo (commercial game)

3) Math Match (commercial card game)

4) Addition/Subtraction Math Path (motivator activity cards)

5) Addition/Subtraction Bingo (motivator activity cards)

6) Cross Numbers I (commercial game)

Text References:

NOTE: Some text references may include money. These pages are to be used with this concept.

Book: 3

Houghton Mifflin (1967)	pp.	116, 179-182, (45,46), 184-185, (47), 319-320.
Houghton Mifflin (1972)	pp.	222-225, (57), 234-235, 246-247, Ex. Pract. 331, 333, (1-12).
Addison-Wesley:(1971,1968)	pp.	68-69, (13, 16, 22, 30, 33), Supp. Ex. 20, 24, 27, 28.

Book: 4

Houghton Mifflin (1967)	pp.	47 (+,-), 48-49
Houghton Mifflin (1972)	pp.	44, (12), 48, #1-10, Supp. Ex. p. 336.
Addison-Wesley(1971,1968)	pp.	38, (1), Supp. Ex. 10, 17.

Book: 5

Houghton Mifflin (1967)	pp.	43, 49, 60, (1-20), 61, (1-13).
Houghton Mifflin (1972)	pp.	41, 58, (1-18).

Other References:

Imperial Tapes (Intermediate), Tape 4.

I. Concept:

Subtraction: Subtracting three-digit numerals which require renaming.

II. Behavioral Objective:

The student given a three-digit addend and sum which require renaming will be able to name the missing addend.

III. Mathematical Ideas:

A. In a three-digit numeral, the third digit from the right is in the hundreds' place, the second digit is in the tens' place, and the first digit is in the ones' place.

B. Any digit is 10 times the value of the digit on the right.

C. Subtraction is the renaming of an addend and a sum as the missing addend.

D. Addition and subtraction are inverse operations.

E. Subtraction is the separation or comparison of sets.

IV. Vocabulary To Stress:

minus
addend
sum
inverse
hundred

V. Activities:

A. Give the children a worksheet that has common mistakes made by children. Challenge them to correct the answers.

Example:
$$\begin{array}{r} 902 \\ -736 \\ \hline 176 \end{array}$$

B. For review of basic facts of subtraction use any of the following activities:

1) Smarty (commercial game)

2) Bingo (commercial game)

3) Math Match (commercial card game)

4) Addition/Subtraction Math Path (motivator activity cards)

5) Addition/Subtraction Bingo (motivator activity cards)

6) Cross Numbers I (commercial game)

V. Activities--Continued

C. Let's Play Games in Mathematics, Vol. 3, Games #40, 43, 45, 55, 59, 63, 65, 77.

D. For an enrichment activity, the teacher can assign addition and subtraction reconstruction problems from Addison-Wesley 3. These problems can be found on p. 81, Supplementary Exercises Set 34, 35, and Ditto 32.

Text References:

NOTE: Some page references may include working with money. Some pages ~~may~~ also include addition problems.

Book: 3

Houghton Mifflin (1967) pp. 119, 121, (35), 179, 281, 319.
Houghton Mifflin (1972) pp. 87, (23), 230, 231, 232, 238, 301. Extra Practice 324, 332-333.
Addison-Wesley(1971,1968) pp. 82, (1,2), (18, 21, 23-25, 34) Supp. Ex. 24, 26-28, 37.

Book: 4

Houghton Mifflin (1967) pp. 50-51, 54, 55, 91 (+,-), 218
Houghton Mifflin (1972) pp. 47, (13), 50-51, 53 (1-14)
Addison-Wesley(1971,1968) pp. 51, (18), 57, (1-6), 58, (1), (20); Supp. Ex. 20.

Book: 5

Houghton Mifflin (1967) pp. 53, 60, (1-30).
Houghton Mifflin (1972) pp. 44, 45, 336, (1-5).

Other References:

Imperial Tapes (Intermediate), Tape 6 and 7.

*Modern Mathematics, Filmstrip 725, Addition and Subtraction

*Modern Mathematics, Filmstrip 719: 1-37

*Suggested Introductory Activity

7-12 Level: 7
Step: A

WORKSHEET: SUBTRACTION PROBLEMS WITH ZERO

1. $\begin{array}{r} 450 \\ -367 \\ \hline \end{array}$

2. $\begin{array}{r} 787 \\ -409 \\ \hline \end{array}$

3. $\begin{array}{r} 120 \\ -14 \\ \hline \end{array}$

4. $\begin{array}{r} 500 \\ -299 \\ \hline \end{array}$

5. $\begin{array}{r} 206 \\ -84 \\ \hline \end{array}$

6. $\begin{array}{r} 600 \\ -328 \\ \hline \end{array}$

7. $\begin{array}{r} 490 \\ -395 \\ \hline \end{array}$

8. $\begin{array}{r} 800 \\ -457 \\ \hline \end{array}$

9. $\begin{array}{r} 310 \\ -295 \\ \hline \end{array}$

10. $\begin{array}{r} 572 \\ -480 \\ \hline \end{array}$

11. $\begin{array}{r} 528 \\ -297 \\ \hline \end{array}$

12. $\begin{array}{r} 700 \\ -236 \\ \hline \end{array}$

13. $\begin{array}{r} 345 \\ -167 \\ \hline \end{array}$

14. $\begin{array}{r} 907 \\ -827 \\ \hline \end{array}$

15. $\begin{array}{r} 400 \\ -296 \\ \hline \end{array}$

16. $\begin{array}{r} 705 \\ -500 \\ \hline \end{array}$

17. $\begin{array}{r} 600 \\ -352 \\ \hline \end{array}$

18. $\begin{array}{r} 756 \\ -398 \\ \hline \end{array}$

19. $\begin{array}{r} 500 \\ -483 \\ \hline \end{array}$

20. $\begin{array}{r} 540 \\ -262 \\ \hline \end{array}$

21. $\begin{array}{r} 705 \\ -508 \\ \hline \end{array}$

22. $\begin{array}{r} 504 \\ -286 \\ \hline \end{array}$

23. $\begin{array}{r} 300 \\ -109 \\ \hline \end{array}$

24. $\begin{array}{r} 800 \\ -732 \\ \hline \end{array}$

25. $\begin{array}{r} 501 \\ -397 \\ \hline \end{array}$

Level: 7 Step: A Concept: Multiplication 7-13

I. Concept:

Multiplication: Multiplying with factors 6-7.

II. Behavioral Objective:

The student given two one-digit factors will be able to name the product.

III. Mathematical Ideas:

A. In multiplication the factors are commutative.

B. Multiplication is the renaming of two factors as a product.

C. Multiplication is repeated addition.

D. Multiplication is the inverse of division.

E. Multiplication is the joining of equivalent sets.

IV. Vocabulary To Stress:

factor	multiplication	equal
product	times (x)	

V. Activities:

A. Egg cartons can be used as arrays to show factors in multiplication.

*B. Green-and-Gold Relay II (Addison-Wesley 3, p. 111). Draw a multiplication table on the chalkboard similar to the one below. This activity can be played with any number of children (large group or small group). Divide the children in two evenly matched teams. Line them up facing the chalkboard. Give the first member of each team a different color of chalk. At the signal from the teacher the two players each put a product in any square he wishes. He then passes the chalk to the next player on his team and goes to the end of the line. Repeat this until all the squares of the table are filled. Using white chalk, circle all correct answers (have children help check accuracy) and cross out all incorrect ones. The team with the greatest number of correct answers wins.

	6	3	7	2	5	4
4						
6						
7						
5						

C. Let's Play Games in Mathematics, Vol. 3, Games #3-5, 10-14, 18, 20, 28, 32, 34, 39, 41, 48, 50-51, 53, 62, 64, 66, 67, 71, 74.

V. Activities: Continued

D. Math Match (commercial card games)

E. The Winning Touch (commercial game)

F. Cross Numbers II (commercial game)

Text References:

NOTE: Page and dittos listed below may include division. The multiplication and division facts may be taught together.

Book: 3

Houghton Mifflin (1967) pp. 194-199, (49-50), 269-270.
Houghton Mifflin (1972) pp. 189-199, (48-52), Extra Practice 325, 326, 329.
Addison-Wesley(1971,1968) pp. 88-89, 112-113, 118, (35, 36); Supp. Ex. 38,39.

Book: 4

Houghton Mifflin (1967) pp. 106, 107, (25); 108, 109, (26), 160, (41).
Houghton Mifflin (1972) pp. 76-77, 189, Supp. Ex. p. 339, 340.
Addison-Wesley(1971,1968) pp. 72, 74, 82-83, (22); Supp. Ex. 23, 25.

Book: 5

Houghton Mifflin (1967) p. 103.
Houghton Mifflin (1972) pp. 66-69.
Addison-Wesley(1971,1968) p. 326, (6)

Other References:

Imperial Tapes (Intermediate), Tape 9.

Countdown (Economy Company), Tapes and Lessons, 40-42, 49, 50.

* Suggested Introductory Activity

Level: 7 Step: A Concept: Division 7-15

I. Concept:

Division: Dividing with factors 6-7.

II. Behavioral Objective:

The student given a one-digit factor and a product not greater than 63 will be able to name the one-digit missing factor.

III. Mathematical Ideas:

A. Division is the inverse of multiplication.

B. Division is the renaming of the product and one factor with a missing factor.

C. Division is separation of a set into equivalent subsets.

D. Division is repeated subtraction.

IV. Vocabulary To Stress:

factor	division	divided by (÷) ($\overline{)\ \ }$)
product	separating	equal

V. Activities:

A. Let's Play Games in Mathematics, Vol. 3, Games #3, 5, 7, 12, 18, 28, 32, 50, 62, 67, 77.

B. Math Match (commercial card games)

C. Cross Numbers II (commercial game)

Text References:

Book: 3

Houghton Mifflin (1967) pp. 196-197, (49), 199, (50), 269-273, (68).
Houghton Mifflin (197) pp. 196, (49), 199, (50), (51, 52).
Addison-Wesley (1971, 1968) pp. 254-255; Supp. Ex. 40, 41.

Book: 4

Houghton Mifflin (1967) pp. 104-109, (25, 26), 160.
Houghton Mifflin (1972) pp. 189, Supp. Ex. 339, 340.
Addison-Wesley (1971, 1968) pp. 73, 75-76, 92, (1-13), 93, (1), (23, 24), 94-95, (1, 2), 98, (1), Supp. Ex. 24, 25.

Book: 5

Houghton Mifflin (1967) p. 103.
Houghton Mifflin (1972) p. 67.
Addison-Wesley (1971, 1968) p. 327.

7-16 Level: 7 Step: A Concept: Division

Text References: Continued

Other References:

Imperial Tapes (Intermediate) Tape 12.

Countdown--(Economy Company) Tapes and Lessons 45-50.

Level: 7
Step: A

WORKSHEET: CHAIN GAME

											END
1.	6	x6		÷4		÷3		÷3		+0	
2.	42	÷7		x3		÷2		x3		-9	
3.	56	÷7		x2		÷4		x5		-7	
4.	48	÷6		x3		÷6		x7		+5	
5.	6	x3		÷9		x7		-5		+12	
6.	49	÷7		x8		-8		+4		-7	
7.	54	÷6		x7		-7		+4		-6	
8.	7	x5		-7		-7		+10		+9	
9.	63	÷7		x2		÷3		x5		-14	

I. Concept:

Geometry: Naming rays, planes, and curves.

II. Behavioral Objective:

The student given a geometric figure will be able to name a ray, a plane, and a curve (closed or not closed).

III. Mathematical Ideas:

A. A ray is part of a line. It has one end point.

B. A plane can be described as a flat surface that extends indefinitely in every direction.

C. A curve is a set of connected points in a plane.

D. A closed curve begins at a given point and returns to that same point. If it doesn't cross itself, it is a simple closed curve.

IV. Vocabulary To Stress:

ray plane curve point

V. Activities:

A. Houghton Mifflin Geoboard, Card 2, 6.

B. Let's Play Games in Mathematics, Vol. 2, Games #35, 71, 81, 83, 100.

C. Let's Play Games in Mathematics, Vol. 3, Games #3, 16, 77.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 62-65, (18), 66-67, (19), 86.
Houghton Mifflin (1972) pp. 99, 101, 114-115, (29), 285, 287.
Addison-Wesley (1971, 1968) p. 44.

Book: 4

Houghton Mifflin (1967) pp. 66, 70-71, 75
Houghton Mifflin (1972) pp. 94, 98, 106, 112-113

Book: 5

Houghton Mifflin (1967) p. 64.
Houghton Mifflin (1972) p. 93.
Addison-Wesley (1971, 1968) pp. 78, 79.

Text References: Continued

Other References:

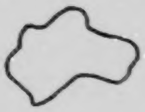
Franklin Series, Paper and Pencil Geometry: curve, pp. 57-60, ray, pp. 63-81.

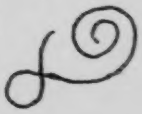
Imperial Tapes (Primary), Lesson 36.

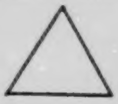
7-20 Level: 7
Step: A

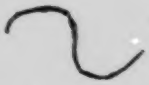
WORKSHEET: GEOMETRY

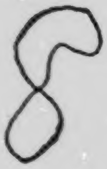
DIRECTIONS: Write CC for closed curve and OC for open curve.

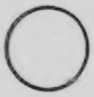
1.  ______

2.  ______

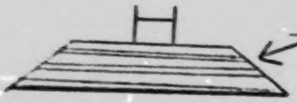
3.  ______

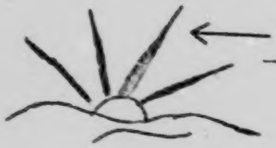
4.  ______

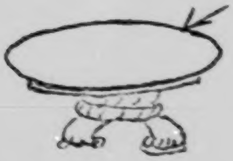
5.  ______

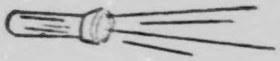
6.  ______

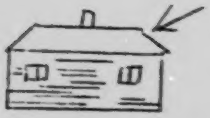
DIRECTIONS: Write P for plane, C for curve, and R for ray.

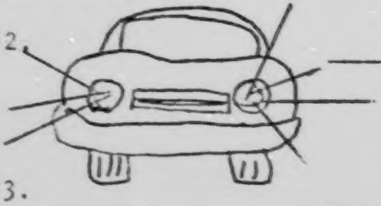
7.  ______

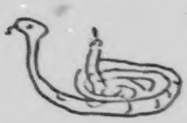
8.  ______

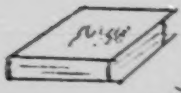
9.  ______

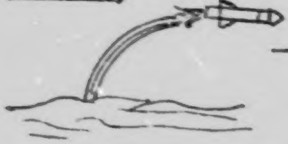
10.  ______

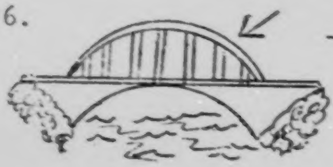
11.  ______

12.  ______

13.  ______

14.  ______

15.  ______

16.  ______

Level: 7 Step: B Concept: Sets

I. Sets: Using the grouping principle in addition.

II. Behavioral Objective:

The student given addition problems will be able to solve equations which require the use of grouping principle.

III. Mathematical Ideas:

A. Addition is a binary operation (we may add only two addends at a time).

B. Addition is associative; that is, to add more than two addends, we may group the addends, two at a time, in any way we wish without affecting the sum.

C. Three or more addends require grouping.

IV. Vocabulary To Stress:

addends group grouping rule sum

V. Activities:

*A. Felt objects on a flannel board can be used to demonstrate the grouping principle. Put a set of 2 objects, a set of 4 objects, and a set of 3 objects on the flannel board. Join the set of 2 objects with the set of 4 objects. On the chalkboard write the equation $2 + 4 + 3 = (2 + 4) + 3$

$$= 6 + 3$$

$$= 9$$

Then move the 9 objects back to their original sets and arrange them so that the equation would be $2 + 4 + 3 = 2 + (4 + 3)$.

$$= 2 + 7$$

$$= 9$$

This activity can be repeated with different addends to demonstrate the grouping rule for addition.

B. Let's Play Games in Mathematics, Vol. 2, Games #35, 36, 39, 51, 52, 59, 61, 74, 84, 90, 92.

C. Let's Play Games in Mathematics, Vol. 3, Game #22.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 40-42, (12)
Houghton Mifflin (1972) pp. 49, (15) Ex. Pract. (extension) 319.
Addison-Wesley(1971,1968) pp. 31-33.

7-22 Level: 7 Step: B Concept: Sets

Text References: Continued

Book: 4

Houghton Mifflin (1967)	pp. 38-39, (9).
Houghton Mifflin (1972)	pp. 32-33, (8).
Addison-Wesley (1971, 1968)	p. 31.

Book: 5

Houghton Mifflin (1967)	pp. 14-15, 36, 40, 316.
Houghton Mifflin (1972)	pp. 31, 32.

* Suggested Introductory Activity

WORKSHEET: SETS-GROUPING RULE

COMPLETE THESE EQUATIONS.

1. 4 + (3 + 7)
= 4 + ______
= ______

2. 6 + (5 + 5)
= 6 + ______
= ______

3. (4 + 8) + 1
= ______ + 1
= ______

4. (7 + 5) + 4
= ______ + 4
= ______

5. (4 + 4) + 9
= ______ + 9
= ______

6. 3 + (3 + 7)
= 3 + ______
= ______

7. (2 + 2) + 3
= ______ + 3
= ______

8. (6 + 3) + 9
= ______ + 9
= ______

9. (4 + 4) + 8
= ______ + 8
= ______

10. 7 + (6 + 2)
= 7 + ______
= ______

11. (5 + 4) + 3
= ______ + 3
= ______

12. (9 + 8) + 1
= ______ + 1
= ______

13. 6 + (6 + 2)
= 6 + ______
= ______

14. (4 + 1) + 5
= ______ + 5
= ______

15. (2 + 2) + 5
= ______ + 5
= ______

16. 6 + (5 + 0)
= 6 + ______
= ______

17. 8 + (3 + 2)
= 8 + ______
= ______

18. 9 + (2 + 4)
= 9 + ______
= ______

19. (3 + 4) + 9
= ______ + 9
= ______

20. 7 + (2 + 8)
= 7 + ______
= ______

I. Concept:

Solving word problems involving addition and subtraction with three-digit numerals.

II. Behavioral Objective:

The student given addition and subtraction word problems with three-place numbers with and without renaming will be able to determine the operation and solve the problem.

III. Mathematical Ideas:

A. In a three-digit numeral, the third digit from the right is in the hundreds' place, the second digit is in the tens' place, and the first digit is in the ones' place.

B. Any digit is 10 times the value of the digit on its right.

C. Addition is the renaming of addends as a sum.

D. Addition and subtraction are inverse operations.

E. Addition is the joining of sets.

F. Subtraction is the separation or comparison of sets.

G. Subtraction is the renaming of an addend and a sum as the missing addend.

H. NOTE: The five-step method for solving story problems is:

Step 1. Think: What are the sets?
Step 2. Think: What is happening to the sets?
Step 3. Write an equation.
Step 4. Solve the equation.
Step 5. Use the number to solve the problem.

I. Word problems require finding another name for the cardinal number of the sets in the problem.

J. Mathematical thinking involves identifying the sets and distinguishing between joining and separating the sets.

IV. Vocabulary To Stress:

hundred
addend

sum
plus

inverse
sets

minus

V. Activities:

*A. A good way to introduce word problems is for the teacher to read a problem orally, have the child solve the problem. Then discuss the problem orally. The teacher can bring in the 5-step method for solving word problems. Reading the problems orally may be especially effective with children who have reading problems.

B. After children have had some experience with word problems, they can make up their own word problems to be solved by themselves or other class members.

C. Let's Play Games in Mathematics, Vol. 2, Games #35, 69, 71, 98, 99.

D. Let's Play Games in Mathematics, Vol. 3, Games #3, 73, 77.

Text References

Book: 3

NOTE: Some references given may include one or two-digit numerals.

Houghton Mifflin (1967)	pp. 110-113, 119, 121, 123, 183, 246-247.
Houghton Mifflin (1972)	pp. 56, 72-75, 89-91, 109, (14), 230-232, 234-239.
Addison-Wesley(1971,1968)	pp. 59, 61, 70, 75, (5), (10), (15), (20).

Book: 4

Houghton Mifflin (1967)	pp. 48, #25-27; 50, #19-21; 62.
Houghton Mifflin (1972)	pp. 44, #25-26; 46, #19-20;
Addison-Wesley(1971,1968)	pp. 41-42.

Book: 5

Houghton Mifflin (1967)	57 Addition Word problems.

* Suggested Introductory Activity

7-26 Level: 7
Step: B

WORKSHEET: ADDITION & SUBTRACTION

DETERMINE THE OPERATION AND SOLVE THE PROBLEM.

1. Jane had a flower garden. She planted 572 roses and 326 tulips. How many flowers did Jane plant?

2. Sam counted 978 railroad cars. If 399 of the railroad cars are passenger cars, how many of the railroad cars are not passenger cars?

3. John collects coins. He needs 143 different coins to fill all the spaces in his coin book. He has 129 coins, now how many more coins does he need to finish his coin book?

4. The cowboys counted 267 cows in the field. They found 316 more cows. How many cows were there altogether?

5. If Jim had 791 stamps and sold 697 of them, how many stamps did he have left?

6. Last week Mark ate 146 chocolate chip cookies and 87 ginger snaps. How many cookies did Mark eat last week?

7. Of the 536 people at the football game, 497 people brought food. How many people at the football game did not bring food?

8. In May, Jane sold 257 roses and in June she sold 163 roses. How many roses did Jane sell in May and June?

9. If a coat costs $3.59 and you give the salesman $5.00, how much change would you get?

10. Fred bought a toy car for $1.20, a game for $5.33, and a baseball for $2.25. How much did the items cost?

WORKSHEET: ADDITION & SUBTRACTION - Continued

11. The cowboys sat down to breakfast. They ate 456 blueberry pancakes and 323 plain pancakes. How many pancakes did they eat?

12. Jack bought a baseball bat that cost $2.09. He gave the salesman $5.00. How much change did Jack get?

13. The box office had 800 tickets to sell. They sold 634 tickets. How many tickets did they have left to sell?

14. If Sam read 398 pages Monday and 285 pages on Tuesday, how many pages did he read in all?

15. There were 685 children at the picnic. If 297 of the children were boys, how many girls were at the picnic?

16. On Monday Joe read 167 pages for homework. On Tuesday he read 324 pages. On Wednesday he read 190 pages. How many pages did he read on Monday and Tuesday?

17. Ted wanted to buy a car for $2.75. He gave the man $4.00. How much money did Ted get back?

18. Kathy is reading a 983-page horse story. She has read 247 pages. How many pages does she still have to read to finish the book?

19. A farmer planted 430 potato plants last year and 285 potato plants this year. How many potato plants did he grow?

20. May collected buttons. She had 180 buttons. Then her mother gave her 354. How many buttons did May have then?

7-28 Level: 7 Step: B Concept: Multiplication & Division

I. Concept:

Solving word problems involving multiplication and division with products not greater than 63.

II. Behavioral Objective:

The student given multiplication and division word problems involving products up to 63 will be able to determine the operation and solve the problem.

III. Mathematical Ideas:

A. In multiplication the factors are commutative.

B. Multiplication is the renaming of two factors as a product.

C. Multiplication is repeated addition.

D. Multiplication is the inverse of division.

E. Multiplication is the joining of equivalent sets.

F. Division is the inverse of multiplication.

G. Division is the renaming of the product and one factor with a missing factor.

H. Division is separation of a set into equivalent subsets.

I. Division is repeated subtraction.

J. Word problems require finding another name for the cardinal number of the sets in the problem.

K. Mathematical thinking involves identifying the sets and distinguishing between joining and separating the sets.

IV. Vocabulary To Stress:

factor
product
multiplication
division
divided by (÷) ($\overline{)\quad}$)
times (x)
equal
joining
separating

V. Activities:

*A. Egg cartons can be used as arrays to show factors in multiplication.

*B. The teacher can provide grocery sale advertisements or sports pages from recent newspapers for the children to use in making up word problems, such as:

There were 4 runners on each relay team. If there were 8 teams, how many runners are there in all?

Level: 7 Step: B Concept: Multiplication & Division 7-29

Text References:

Book: 3

Houghton Mifflin (1967) pp. 139, 144, 149, 194-199, 202. (1-8), 203.
Houghton Mifflin (1972) pp. 146, 148-149, 190-199, 202-204.
Addison-Wesley(1971,1968)pp. 90-91, 93, 112-113, 116, 139, 155, 157, 159, 163, (37).

Book: 4

Houghton Mifflin (1967) pp. 110, 111.
Houghton Mifflin (1972) pp. 64-65, 80-81, (21).
Addison-Wesley(1971,1968)pp. 77, 87, (1-11), 97, 99, (25).

Other References:

Countdown (Economy Company) Tapes and Lessons 45-50.

* Suggested Introductory Activity

7-30 Level: 7
Step: B

WORKSHEET: MULTIPLICATION & DIVISION - SETS

DETERMINE THE OPERATION AND SOLVE THE PROBLEM.

1. Georgia bought 6 lemon cookies. The cookies cost 6¢ each. How much did Georgia pay for the 6 cookies?

2. Linda is collecting shells. She keeps the shells in a frame. She had 4 rows with 7 shells in each row. How many shells does Linda have?

3. If Ted has 7 rows of cars with 9 cars in each row, how many cars does he have?

4. Bill went on a bike ride. He went 48 miles in 6 hours. How many miles did he go in each hour?

5. Ellen baked cookies. She made 49 cookies with 7 cookies in each row. How many rows did she make?

6. Lucy can iron a shirt in 9 minutes. How many shirts can she iron in 54 minutes?

7. Sam had 6 packages of bubble gum. There were 7 pieces of gum in each package. How many pieces of bubble gum does Sam have?

8. Sally has picked 54 roses. She wants to give them away equally to 6 friends. How many roses will each of her friends get?

9. John went on vacation with his family. He took 7 rolls of film. There were 3 pictures on each roll of film. How many pictures did John take?

10. Denny wants to plant 24 cabbage plants. He wants to put them into 4 equal rows. How many plants will he have in each row?

11. If one quart of orange drink costs 9 cents, how much would you have to pay for 6 quarts?

12. The children want to put on a play. They have 36 chairs for the show. They want to put them into 6 rows. How many chairs will be in each row?

I. Concept:

Geometry: Naming angles and parallel lines.

II. Behavioral Objective:

The student given geometric figures will be able to name angles and parallel lines.

III. Mathematical Ideas:

A. A ray is part of a line. It has one end point.

B. An angle is two rays which have a common end point.

C. Two lines in the same plane that do not meet are parallel.

IV. Vocabulary To Stress:

parallel angle ray

V. Activities:

*A. Houghton Mifflin Geocard 26.

B. Let's Play Games in Mathematics, Vol. 3, Games #16 and 77.

*C. The teacher can bring in pictures and have the children look for objects that have parallel lines and angles.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 74-77, (21), 288-290.
Houghton Mifflin (1972) pp. 101-102, 285-287, (25)
Addison-Wesley (1971,1968) pp. 45-47, 128-131, 134-135, 190-193.

Book: 4

Houghton Mifflin (1967) pp. 73, 74, (15, 1-8)
Houghton Mifflin (1972) pp. 98, 99, 107

Book: 5

Houghton Mifflin (1967) pp. 67, 73, 264.
Houghton Mifflin (1972) pp. 103, 290.
Addison-Wesley (1971,1968) pp. 84, 94.

Other References:

Franklin Series, Learn to Fold--Fold to Learn, parallel lines, p. 86.

Franklin Series, Paper and Pencil Geometry, angle, pp. 17-21, 38-39, 49-53, 67-70, 81-84, 93; parallel lines, pp. 47, 50-51.

* Modern Mathematics, Filmstrip 731: 9-17

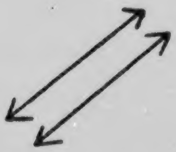
* Suggested Introductory Activity

7-32 Level: 7
Step: B

WORKSHEET: GEOMETRY

WRITE P IF THE TWO LINES ARE PARALLEL. WRITE NP IF THE TWO LINES ARE NOT PARALLEL.

1.



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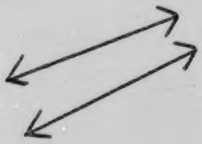

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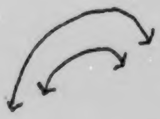

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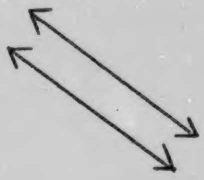

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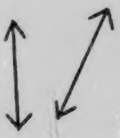

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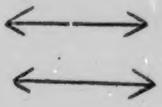

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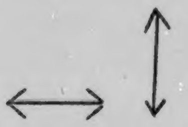
7.



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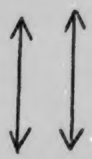
8.



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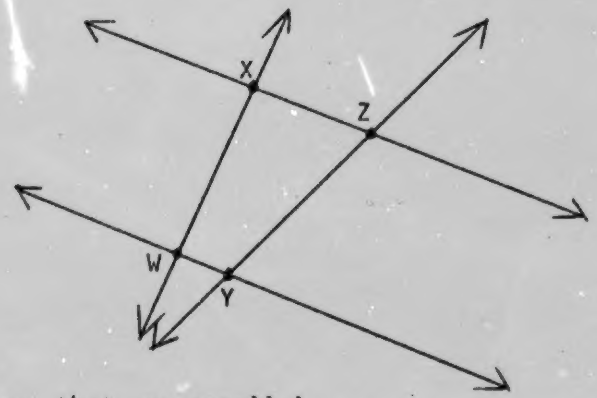


9. Name two lines that are parallel. ______

10. Name two lines that are not parallel. ______

11. Name the rays that formed <WXZ. ______

12. Give the letter name of the angle formed by $\overrightarrow{WX}$ and $\overrightarrow{WY}$. ______

13. Give the letter name of the angle formed by $\overrightarrow{ZX}$ and $\overrightarrow{ZY}$. ______

14. Name the rays that formed <XWY. ______

15. Name the rays that formed <XZY. ______

I. Concept:

Measurement: Measuring line segments to the nearest one-fourth inch

II. Behavioral Objective:

The student given a line segment will be able to measure it to the nearest one-fourth inch.

III. Mathematical Ideas:

A. Measurement is a form of comparison.

B. Measuring length is comparing a standard unit of length with the length of the object being measured.

C. The number of units that match the quantity being measured is called the measure.

IV. Vocabulary To Stress:

inch	measure	length	feet
ruler	unit	line segments	

V. Activities:

*A. Make several line segments of varying lengths using tagboard. The children can measure these line segments in small groups or individually.

*B. Make a transparency with line segments of varying lengths. Make or buy a transparent ruler. Use the overhead projector for this activity. The teacher can use this to demonstrate and the children can use it as an independent activity.

C. The teacher can give the children a list of varying measures such as 2 3/4, 3 1/2, 5 1/4, etc. and ask the children to draw line segments for each length.

Text References:

Book: 3

Houghton Mifflin (1967)	pp. 68-72, (20), 174.
Houghton Mifflin (1972)	p. 180.
Addison-Wesley(1971,1968)	pp. 168, (40), 169-177.

Book: 4

Houghton Mifflin (1967)	p. 69.
Houghton Mifflin (1972)	p. 103 (includes cm.)
Addison-Wesley(1971,1968)	pp. 114-117, (23), 129, (33).

Text References: Continued

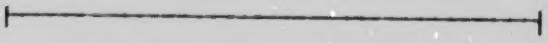
Other References:

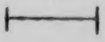
Franklin Series, Learning About Measurement, pp. 4-19.

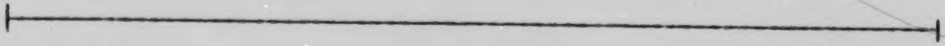
* Modern Mathematics, Filmstrip 718: 1-32

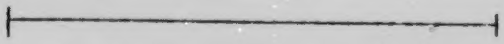
* Suggested Introductory Activity

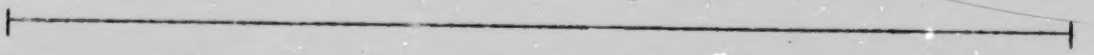
WORKSHEET: MEASUREMENT

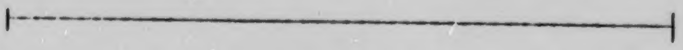
1. 

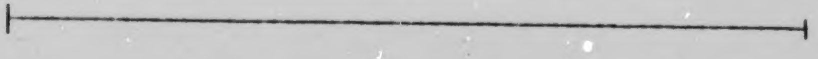
2. 

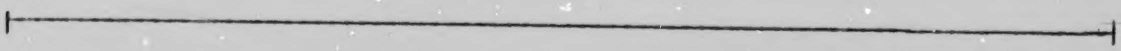
3. 

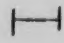
4. 

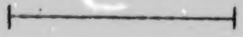
5. 

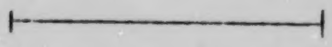
6. 

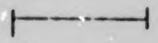
7. 

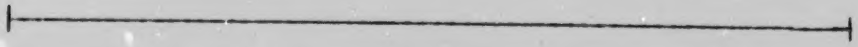
8. 

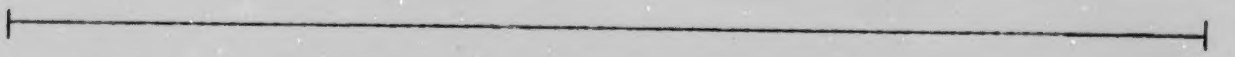
9. 

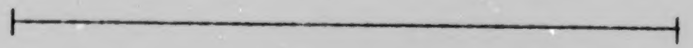
10. 

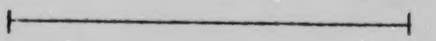
11. 

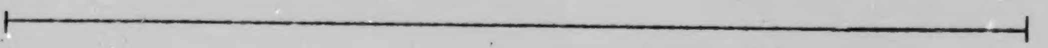
12. 

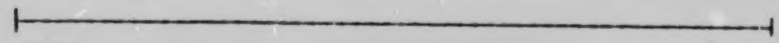
13. 

14. 

15. 

16. 

17. 

18. 

WORKSHEET ANSWERS

7-4

1. 2000 + 100 + 40 + 3
2. 5000 + 500 + 70 + 5
3. 4000 + 900 + 20 + 7
4. 3000 + 800 + 60
5. 9000 + 900 + 80 + 8

6. 1765
7. 9999
8. 4831
9. 8230
10. 5122

11. 1
12. 9
13. 4
14. 2
15. 3

16. 6
17. 7
18. 9
19. 3
20. 7

21. 4
22. 0
23. 9
24. 6
25. 5

26. 4
27. 2
28. 3
29. 1
30. 4

7-7

1. ----
2. 1459, 1461
3. 8751, 8753
4. 4335, 4337
5. 9158, 9160
6. 2035, 2037
7. 999, 1001
8. 3459, 3461

9. 5871, 5873
10. 4039, 4041
11. 786, 788
12. 8000, 8002
13. 6851, 6853
14. 1255, 1257
15. 2457, 2459

16. T
16. T
18. F
19. F
20. T

21. T
22. T
23. F
24. T
25. T

26. <
27. =
28. >
29. >
30. >

31. <
32 <
33. >
34. >
35. >

7-12

1. 83
2. 378
3. 106
4. 201
5. 122

6. 272
7. 95
8. 343
9. 15
10. 92

11. 231
12. 464
13. 178
14. 80
15. 104

16. 205
17. 248
18. 358
19. 17
20. 278

21. 197
22. 218
23. 191
24. 68
25. 104

7-17

1. 36, 9, 3, 1, 1
2. 6, 18, 9, 27, 18
3. 8, 16, 4, 20, 13
4. 8, 24, 4, 28, 33
5. 18, 2, 14, 9, 21

6. 7, 56, 48, 52, 45
7. 9, 63, 56, 60, 54
8. 35, 28, 21, 31, 40
9. 9, 18, 6, 30, 16

7-20

1. CC
2. OC
3. CC
4. OC

5. CC
6. CC
7. P
8. R

9. P
10. R
11. P
12. R

13. C
14. P
15. C
16. C

7-23

1. 10, 14
2. 10, 16
3. 12, 13
4. 12, 16

5. 8, 17
6. 10, 13
7. 4, 7
8. 9, 18

9. 8, 16
10. 8, 15
11. 9, 12
12. 17, 18

13. 8, 14
14. 5, 10
15. 4, 9
16. 5, 11

17. 5, 13
18. 6, 15
19. 7, 16
20. 10, 17

WORKSHEET ANSWERS: CONTINUED

7-26 and 7-27

1. 893 flowers
2. 579 cars
3. 14 coins
4. 583 cows
5. 94 stamps
6. 233 cookies
7. 39 people
8. 420 roses
9. $1.41
10. $8.78
11. 779 pancakes
12. $2.91
13. 166 tickets
14. 683 pages
15. 388 girls
16. 491 pages
17. $1.25
18. 736 pages
19. 715 plants
20. 534 buttons

7-30

1. 36¢
2. 28 shells
3. 63 cars
4. 8 miles
5. 7 rows
6. 6 shirts
7. 42 pieces
8. 9 roses
9. 56 pictures
10. 6 plants
11. 54¢
12. 6 chairs

7-32

1. P
2. NP
3. NP
4. P
5. NP
6. P
7. NP
8. P
9. $\overleftrightarrow{XZ}$ & $\overleftrightarrow{WY}$
10. $\overleftrightarrow{XW}$ and $\overleftrightarrow{ZY}$
11. $\overrightarrow{XW}$ and $\overrightarrow{XZ}$
12. <XWY or <YWX
13. <XZY or <YZX
14. $\overrightarrow{WX}$ and $\overrightarrow{WY}$
15. $\overrightarrow{ZX}$ and $\overrightarrow{ZY}$

7-35

1. 3 inches
2. 1/2 inch
3. 5 1/4 inches
4. 2 3/4 inches
5. 6 inches
6. 3 3/4 inches
7. 4 1/2 inches
8. 6 1/4 inches
9. 1/4 inch
10. 1 1/4 inches
11. 1 3/4 inches
12. 3/4 inch
13. 4 3/4 inches
14. 6 3/4 inches
15. 3 3/4 inches
16. 2 1/4 inches
17. 5 3/4 inches
18. 4 1/4 inches

Placement Test

ANSWER KEY

Multiplication Facts

1. 36
2. 35
3. 18
4. 12
5. 48
6. 21
7. 35
8. 54
9. 18
10. 24
11. 63
12. 42
13. 30
14. 54
15. 28
16. 49
17. 14
18. 7
19. 24
20. 28
21. 56
22. 48
23. 12
24. 21
25. 30
26. 56
27. 14
28. 42
29. 6
30. 63

Division Facts

1. 9
2. 7
3. 6
4. 8
5. 6
6. 6
7. 2
8. 7
9. 8
10. 6
11. 6
12. 4
13. 6
14. 7
15. 4
16. 6
17. 7
18. 7
19. 1
20. 6
21. 3
22. 5
23. 7
24. 5
25. 2
26. 9
27. 7
28. 3
29. 6
30. 7

ANSWER KEY
Post Test I

Step: A

Sets

1. 4
2. 9
3. 3
4. 2
5. 5

Numeral

6. 4
7. 4
8. 9
9. 9
10. 5

Order

11. <
12. =
13. >
14. <
15. <

Addition

16. 681
17. 472
18. 845
19. 933
20. 375

Subtraction

21. 214
22. 482
23. 218
24. 326
25. 231

Multiplication

26. 36
27. 18
28. 48
29. 21
30. 35
31. 14
32. 24
33. 63
34. 42
35. 30
36. 54
37. 28
38. 49
39. 56
40. 21

Division

41. 6
42. 3
43. 8
44. 3
45. 5
46. 7
47. 6
48. 7
49. 6
50. 5
51. 6
52. 4
53. 7
54. 6
55. 7

Geometry

56. ray
57. open curve
58. closed curve
59. plane
60. ray

Step: B

Sets

61. 4, 10
62. 8, 16
63. 10, 15
64. 10, 17
65. 7, 9

Addition-Subtraction

Each problem is worth 2 points, 1 point for determining the correct operation and 1 point for finding the correct answer.

66. subtract, 434 cookies
67. subtract, 386 flowers
68. add, 779 bottle caps
69. subtract, 8 roses
70. add, 996 pictures
71. add, 825 baby chicks
72. subtract, 290 baseball cards
73. add, 923 stamps
74. subtract, 87 children
75. add, 1357 animal pictures

ANSWER KEY
Post Test I

Multiplication-Division

Each problem is worth 2 points, 1 point for determining the correct operation and 1 point for finding the correct answer.

76. multiply, 42 miles
77. divide, 7¢
78. divide, 7 miles
79. multiply, 48 cookies
80. divide, 7¢
81. divide, 7 candy bars
82. multiply, 63 baloons
83. divide, 7 stamps
84. multiply, 56 pieces of candy
85. multiply, 36 pieces of fudge

Geometry

86. $\overleftrightarrow{AD}$ and $\overleftrightarrow{BC}$
87. $\overrightarrow{BA}$ and $\overleftrightarrow{CD}$
88. $\overrightarrow{CB}$ and $\overrightarrow{CD}$
89. <ABC or <CBA
90. <CDA or <ADC

Measurement

91. 2 1/4"
92. 3/4"
93. 3 1/4"
94. 2 3/4"
95. 1 3/4"

ANSWER KEY
Post Test II

Step: A

Sets

1. 6
2. 8
3. 4
4. 6
5. 5

Numeral

6. 6
7. 8
8. 7
9. 5
10. 7

Order

11. <
12. =
13. >
14. >
15. <

Addition

16. 807
17. 1412
18. 740
19. 912
20. 900

Subtraction

21. 329
22. 537
23. 249
24. 135
25. 263

Multiplication

26. 36
27. 18
28. 48
29. 21
30. 35
31. 14
32. 24
33. 63
34. 42
35. 30
36. 54
37. 28
38. 49
39. 56
40. 21

Division

41. 6
42. 3
43. 8
44. 3
45. 7
46. 7
47. 6
48. 7
49. 6
50. 5
51. 6
52. 4
53. 7
54. 7
55. 7

Geometry

56. open curve
57. ray
58. closed curve
59. plane
60. ray

Step: B

Sets

61. 7, 10
62. 9, 11
63. 5, 7
64. 7, 10
65. 4, 9

Addition-Subtraction

Each problem is worth 2 points, 1 point for determining the correct operation and 1 point for finding the correct answer.

66. subtract, 250 people
67. add, 799 buttons
68. add, 677 beads
69. subtract, 189 cookies
70. add, 1353 paper doll outfits
71. subtract, 69 people
72. subtract, 44 feet
73. add, 1482 strawberries
74. subtract, 337 seeds
75. add, 1526 seeds

Multiplication-Division

Each problem is worth 2 points, 1 point for determining the correct operation and 1 point for finding the correct answer.

76. multiply, 56 popcorn balls
77. multiply. 54 sticks
78. divide, 6 bags
79. divide, 6 trays
80. multiply, 42 stars
81. divide, 6 bunches
82. divide, 7 walnuts
83. multiply, 35¢
84. divide, 7 pages
85. multiply, 63¢

Geometry

86. $\overleftrightarrow{NO}$ and $\overleftrightarrow{ET}$
87. $\overleftrightarrow{EN}$ and $\overleftrightarrow{TO}$
88. $\overrightarrow{TE}$ and $\overrightarrow{TO}$
89. <ONE or <ENO
90. <NET or <TEN

Measurement

91. 4 1/4"
92. 1 3/4"
93. 3 1/4"
94. 2 1/4"
95. 4 3/4"

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I. Concept:

Sets: Using the commutative principle with multiplication.

II. Behavioral Objective:

The student given multiplication problems will be able to solve equations which require the use of the commutative principle.

III. Mathematical Ideas:

A. Addition and multiplication are commutative. Subtraction and division are not commutative.

B. The commutative property of multiplication means that the order of the factors does not affect the product.

IV. Vocabulary to Stress:

order order rule commutative principle

V. Activities:

*A. Use felt cutouts on the flannel board to demonstrate the commutative principle of multiplication. Put 3 sets of 2 objects on the flannel board. Then change the objects to show 2 sets of 3. Write the equation on the chalkboard to represent what you have done, 3 x 2 = 2 x 3.

B. Let's Play Games in Mathematics, Volume Three, Game Number 39, 51, 53, 54, 62, 77.

Text References:

Book: 3

Houghton Mifflin (1967) p. 313.
Houghton Mifflin (1972) pp. 126, 138.
Addison-Wesley (1971, 1968) pp. 98-99.

Book: 4

Houghton Mifflin (1967) p. 97.
Houghton Mifflin (1972) p. 70.

Book: 5

Houghton Mifflin (1967) pp. 14-15.
Houghton Mifflin (1972) pp. 66, 261.
Addison-Wesley (1971, 1968) p. 46.

Book: 6

Houghton Mifflin (1967) p. 43

* Suggested Introductory Activity

8-2 Level: 8 Step: A Concept: Sets

WORKSHEET

WRITE THE NUMERAL TO MAKE THE EQUATION TRUE.

1. 6 x 7 = 7 x _____
2. 3 x 2 = _____ x 3
3. 9 x 8 = 8 x _____
4. 9 x 0 = _____ x 9
5. 15 x 20 = _____ x 15
6. 4 x _____ = 5 x 4
7. _____ x 6 = 6 x 9
8. _____ x 10 = 10 x 5
9. 7 x _____ = 4 x 7
10. 5 x 6 = 6 x _____
11. 8 x 4 = _____ x 8
12. _____ x 6 = 6 x 3
13. 5 x _____ = 9 x 5
14. _____ x 1 = 1 x 6
15. 7 x 9 = _____ x 7
16. 2 x 4 = _____ x 2
17. 3 x 7 = 7 x _____
18. 5 x _____ = 8 x 5
19. 6 x _____ = 6 x 6
20. 8 x 7 = _____ x 8
21. _____ x 6 = 6 x 4
22. 7 x _____ = 1 x 7
23. 3 x 5 = _____ x 3
24. 6 x _____ = 9 x 6
25. _____ x 3 = 3 x 4
26. 10 x 2 = 2 x _____
27. 3 x _____ = 8 x 3
28. 2 x 9 = _____ x 2
29. 7 x _____ = 7 x 7
30. _____ x 6 = 6 x 8
31. 5 x 7 = _____ x 5
32. 6 x 5 = _____ x 6
33. 2 x 7 = 7 x _____
34. 1 x 7 = _____ x 1
35. _____ x 5 = 5 x 0
36. 9 x _____ = 3 x 9
37. 0 x _____ = 2 x 0
38. 2 x 8 = _____ x 2
39. 1 x 9 = 9 x _____
40. 0 x _____ = 6 x _____

I. Concept:

Multiplication: Multiplying with factors 8 - 9.

II. Behavioral Objective:

The student given two one-digit factors will be able to name the product.

III. Mathematical Ideas:

A. In multiplication the factors are commutative.

B. Multiplication is the renaming of two factors as a product.

C. Multiplication is repeated addition.

D. Multiplication is the inverse of division.

E. Multiplication is the joining of equivalent sets.

IV. Vocabulary To Stress:

factor multiplication equal
product times (x)

V. Activities:

A. Egg cartons can be used as arrays to show factors in multiplication.

B. Math Match (Commercial card games)

C. The Winning Touch (Commercial game)

D. Cross Number II (Commercial game)

Text References:

NOTE: Pages and dittos listed below may include division. The multtplication and division facts may be taught together.

Book: 3

Houghton Mifflin (1967) pp. 200-201, (51-52), 269-271, (68 69).
Houghton Mifflin (1972) pp. 200-202, (48-52), Extra Practice 325, 326, 329.
Addison-Wesley (1971, 1968) pp. 88-89, 114-115, 118, 127, (35, 36), 186; Supp. Ex. 38, 39.

Book: 4

Houghton Mifflin (1967) pp. 106, 107. (25); 108, 109, (26), 160, (41).
Houghton Mifflin (1972) pp. 63, 73-74, 189, Supp. Ex. p. 339, 340.
Addison-Wesley (1971, 1968) pp. 74, 85, (22); Supp. Ex. 23, 25.

Text References, Continued

Book: 5

Houghton Mifflin (1967) p. 103.
Houghton Mifflin (1972) pp. 66-69.
Addison-Wesley (1971, 1968) p. 326.

Other References:

Imperial Tapes (Intermediate), Tape 9.

Countdown (Economy Company), Tapes and Lessons, 40-42, 49, 50.

Level: 8 Step: A Concept: Division 8-5

I. Concept:

Division: Dividing with factors 8 - 9.

II. Behavioral Objective:

The student given a one-digit factor and a product not greater than 81 will be able to name the one-digit missing factor.

III. Mathematical Ideas:

A. Division is the inverse of multiplication.

B. Division is the renaming of the product and one factor with a missing factor.

C. Division is separation of a set into equivalent subsets.

D. Division is repeated subtraction.

IV. Vocabulary To Stress:

factor
product
division
separating
divided by (÷) ($\overline{)\quad}$)
equal

V. Activities:

A. *Let's Play Games in Mathematics*, Vol. Three, Games #3, 5, 7, 12, 18, 28, 32, 50, 62, 67, 77.

B. Math Match (Commercial card game)

Test References:

Book: 3

Houghton Mifflin (1967) pp. 196-197, 200, (51), 201, (52), 269-273, (68-69).
Houghton Mifflin (1972) pp. 196, (49), (51-52), 306.
Addison-Wesley (1971, 1968) pp. 152, (38, 39), 254-255; Supp. Ex. 40,41.

Book: 4

Houghton Mifflin (1967) pp. 104-109, (25, 26), 160.
Houghton Mifflin (1972) p. 189, Supp. Ex. 339, 340.
Addison-Wesley (1971, 1968) pp. 73, 75-76, 92-93, (23, 24), 94-95, 98, Supp. Ex. 24, 25

Book: 5

Houghton Mifflin (1967) p. 103
Addison-Wesley (1971, 1968) p. 327.

Other References:

Imperial Tapes (Intermediate) Tape 12.
Countdown--(Economy Company)
Tapes and Lessons 45-50.

8-6 Level: 8 Step: A Concept: Division

WORKSHEET: CHAIN GAME

	Start												END
1.	63	÷ 7		x 2		÷ 3		x 8		+ 8		- 6	
2.	81	÷ 9		x 4		÷ 6		x 8		- 8		+10	
3.	54	÷ 6		÷ 3		x 9		- 9		+ 7		- 9	
4.	42	÷ 7		x 6		÷ 9		x 8		- 6		+ 8	
5.	56	÷ 8		x 1		x 6		÷ 6		+ 9		- 9	
6.	64	÷ 8		÷ 4		x 9		÷ 6		x 8		÷ 4	
7.	72	÷ 9		x 8		- 8		+ 7		- 9		- 7	
8.	48	÷ 8		x 3		÷ 9		x 7		+ 9		- 7	
9.	49	÷ 7		x 8		- 8		- 9		+ 5		- 8	

I. Concept:

Geometry: Naming triangles, squares, rectangles, quadrilaterals, and parallelograms.

II. Behavioral Objective:

The student given geometric figures will be able to name triangles, squares, rectangles, quadrilaterals and parallelograms.

III. Mathematical Ideas:

A. A triangle is a simple closed curve formed by three line segments joined at their end points.

B. A square is a simple closed curve formed by four line segments of equal length joined at their corner points.

C. A rectangle is a parallelogram whose angles are all right angles.

D. A quadrilateral is a simple closed curve formed by the joining of four line segments.

E. A parallelogram is a quadrilateral whose opposite sides are parallel and the same length.

F. A polygon is a closed geometric figure made up of line segments.

IV. Vocabulary To Stress:

square
triangle
rectangle
quadrilateral
parallelogram
polygon
diagonal lines

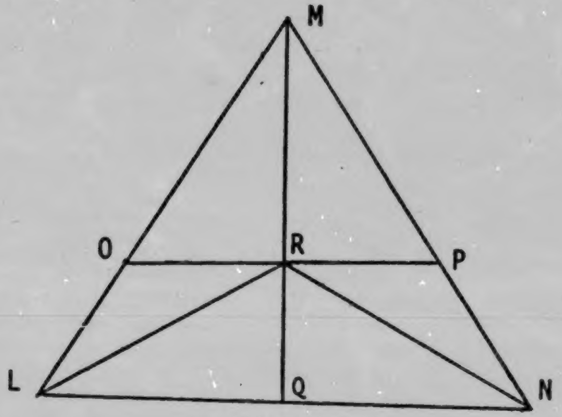
V. Activities:

*A. Matching Game. Each child will need a small paper sack and different geometric figures such as square, triangle, rectangle, parallelogram, hexagon, pentagon, etc. The geometric figures can be made by the children from heavy cardboard. One child acts as a leader and takes a shape out of his bag. He tells the children what shape he took out. The other children, using their sense of touch, take the same shape out of their bag. The children are not allowed to look in their sack to find the shape.

*B. The teacher can make flash cards with geometric terms on them. For example, terms such as hexagon, triangle, diagonal, etc. can be used. The child must demonstrate that he knows what the term means by drawing, writing, or telling its meaning.

V. Activities: continued

*C. "The Magic Triangle." Ask the children to count the triangles in this figure. Careful counting should produce 13. To keep an accurate record, the children may use letters MOR, MOP, . . .



Can you find any other geometric figures?

*D. Use pegboards and pegs, nailboards and pushpins, or commercial Geoboards, with colored yarns or colored rubberbands to explore properties of geometric shapes and line designs. Children can reproduce geometric shapes, create original designs and find solutions to problems such as, "How many triangles can I make from one square unit?" This is also useful for multiplication, division, or fractional problems.

*E. "Guessing Game." The children can hide their eyes or use a blindfold. There are two teams. The teacher hands a child on one team a piece of cardboard shaped like a triangle, square, rectangle, hexagon, parallelogram, etc. The child makes some statement about the shape of the cardboard; "It's a simple closed curve." He then pases it along to the next child on his team who says, "It's a polygon." The next child says, "It has four right angles," and so on. Any child on the other team may volunteer a guess by raising his hand, and the teacher will allow one guess for each statement. The number of statements needed before a successful guess is made provides a score for the team giving the clues. Any incorrect statement can be overruled by the teacher. All statements are based upon touch. All answers must be based on these statements.

F. Houghton Mifflin Geocard #3, 5, 29. These are activity cards to use with Houghton Mifflin Geoboards.

G. Let's Play Games in Mathematics, Volume Three, Game #19.

V. Activities: continued

H. Attach geometric figures to a bulletin board. Under each figure place one or more questions about the figure. For example, under parallelogram:

a. Are there right angles in the figure?
b. Are the opposite sides of equal length?

The class can be divided into two teams. Each player selects a figure, gives its name, and takes it from the board. To keep the figure (trophy), the player must answer all questions correctly. The team with the greatest number of trophies wins.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 80-83, (22), 86-87, (24), 291.
Houghton Mifflin (1972) pp. 93, 98, 102.
Addison-Wesley (1971, 1968) pp. 44-51, 132-135, 194-197.

Book: 4

Houghton Mifflin (1967) pp. 77 (includes measurement).
Houghton Mifflin (1972) pp. 108-109. (includes measurement).

Book: 5

Houghton Mifflin (1967) pp. 74-75.
Houghton Mifflin (1972) pp. 108-109.

Other References:

Franklin Series, Learn to Fold, Fold to Learn: rectangle, 13-20, 48, 89-94; triangle, 14; square, 14, 89-94.

Franklin Series, Patterns and Puzzles in Mathematics: Count the Triangles, 60.

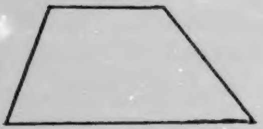
Franklin Series, Paper and Pencil Geometry: diagonal, 40; hexagon, 55-56, 74; parallelogram, 50-51, 73; polygon, 55, 60; quadrilateral, 48-51; rectangle, 5, 10, 15-18, 34, 38-43, 46, 49, 71, 75, 77, 90, 94, 98; square, 5, 8, 10, 22, 38-43, 49, 72, 76-77, 80, 90, 98; triangle, 5, 10, 12, 19-23, 35, 40, 46, 52-55, 62, 73, 78, 81-84, 98.

* Suggested Introductory Activity

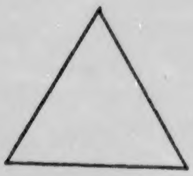
8-10 Level: 8 Step: A Concept: Geometry

WORKSHEET

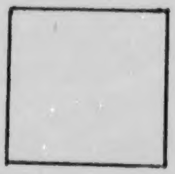
WRITE Q IF THE FIGURE IS A QUADRILATERAL. IF IT IS NOT, WRITE NQ.



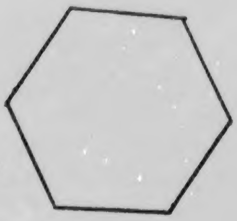
1. ________



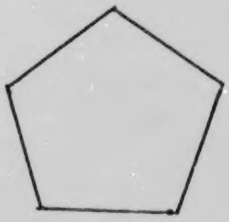
2. ________



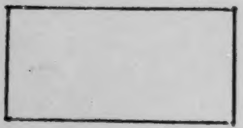
3. ________



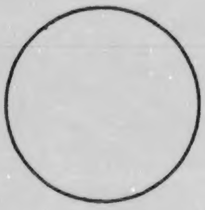
4. ________



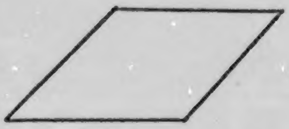
5. ________



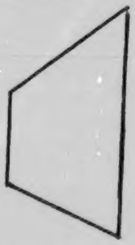
6. ________



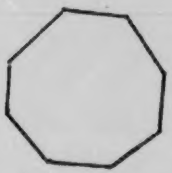
7. ________



8. ________

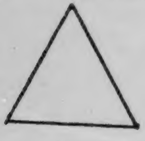


9. ________

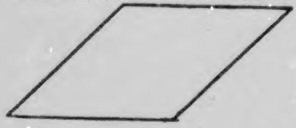


10. ________

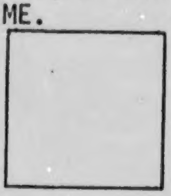
NAME EACH SHAPE AS A TRIANGLE, A SQUARE, A RECTANGLE, A PARALLELOGRAM OR A QUADRILATERAL. USE EACH WORD ONE TIME.



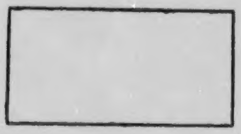
11. ________



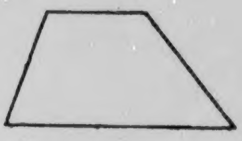
12. ________



13. ________



14. ________



15. ________

16. Draw a square.

17. Draw a parallelogram.

18. Draw a triangle.

19. Draw a quadrilateral.

20. Draw a rectangle.

*21. Draw a polygon.

* extra credit

I. Concept:

Measurement: Telling time to the nearest minutes.

II. Behavioral Objective:

The student given clock diagrams will be able to read and write the manes for times to the nearest 5 minutes.

III. Mathematical Ideas:

A. The numerals on a clock face is a special kind of number line.

B. The numerals on the clock face are a circular number line.

IV. Vocabulary To Stress:

hour	to	quarter
minute	past	half

V. Activities:

*A. Telling Time. The teacher will need a large clock face for activity. Divide the children into two teams. The teacher sets the clock at a certain time and shows it to the first member of Team A. If that child knows the time shown on the clock, then his team gets a point. The teacher then puts another time on the clock and shows it to the first person on Team B, and so on. The team with the most points wins.

B. Tell-Time Quizmo (commercial game).

C. Let's Play Games in Mathematics, Volume One, Game Number 18.

Text References:

Book: 2

Addison-Wesley (1971, 1968) pp. 133-136, (36, 37).

Book: 3

Houghton Mifflin (1967) pp. 150-152, (40), 156, 174.
Houghton Mifflin (1972) pp. 150-153, (38).

Other References:

Franklin Series, Learning About Measurement: pp. 74-84

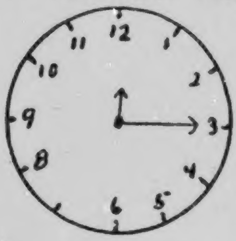
*Modern Mathematics, Filmstrips 721: 1-19 709: 1-40

* Suggested Introductory Activity

8-12 Level: 8 Step: A Concept: Measurement

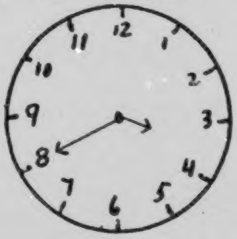
WORKSHEET

WRITE TWO NAMES FOR THE TIME SHOWN ON THE CLOCKS.



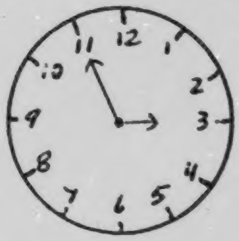
1. ____ minutes past ____

____



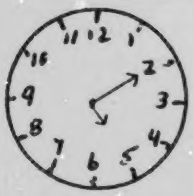
2. ____ minutes past ____

____



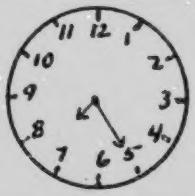
3. ____ minutes to ____

____



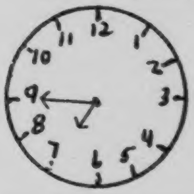
4. ____ minutes past ____

____



5. ____ minutes past ____

____

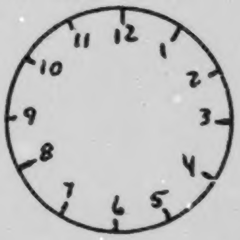


6. ____ minutes to ____

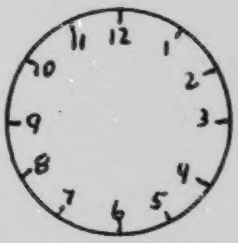
____

DRAW THE HANDS TO SHOW THE TIME GIVEN.

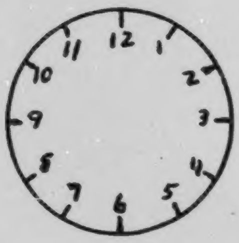
7. 6:15



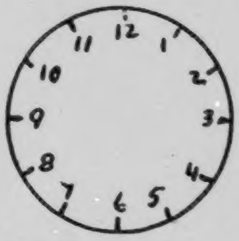
8. 8:45



9. 12:30



10. 2:20



11. 11:40

12. 10:10

I. Concept:

Sets: Using the distributive principle to solve equations.

II. Behavioral Objective:

The student given equations will be able to solve the problems by using the distributive property of multiplication over addition.

III. Mathematical Ideas:

A. When two addends have a common factor, their sum can be expressed as the product of the common factor and the sum of the other factors.

IV. Vocabulary To Stress:

factor	common factor	renaming
addends	distributive	multiply

V. Activities:

A. Note: In reference to "Common Factor Rule" before teaching page 190, HM 3. (Distributive Property of Multiplication over Addition). Here, one of our factors is broken into two addends (the sum of which is the uncommon factor). Each of these two addends is then individually multiplied by the other, common factor. This process is useful because a difficult problem can be simplified by being broken down into smaller, easier units or problems. The teaching of this concept is easier if at first it is taught with problems where one of the factors is an even number which can be broken into a "double." For example: in 8 x 9, we can use (4 x 9) + (4 x 9) = 8 x 9

$$\begin{array}{ccccc} (4 \times 9) & + & (4 \times 9) & = & 8 \times 9 \\ 36 & + & 36 & = & 72 \end{array}$$

as versus: 8 x 9 = (5 x 9) + (3 x 9) = 8 x 9

$$\begin{array}{ccccc} (5 \times 9) & + & (3 \times 9) & = & 8 \times 9 \\ 45 & + & 27 & = & 72 \end{array}$$

This second version is more difficult for the child to comprehend or solve.

Additional practice problems:

1. 4 x 5 = (2 x 5) + (2 x 5)
2. 5 x 6 = (5 x 3) + (5 x 3)
3. 2 x 8 = (2 x 4) + (2 x 4)
4. 4 x 4 = (4 x 2) + (4 x 2)
5. 8 x 5 = (4 x 5) + (4 x 5)
6. 7 x 8 = (7 x 4) + (7 x 4)
7. 8 x 8 = (8 x 4) + (8 x 4)
8. 6 x 9 = (3 x 9) + (3 x 9)
9. 4 x 6 = (4 x 3) + (4 x 3)
10. 6 x 7 = (3 x 7) + (3 x 7)

V. Activities: Continued

B. Let's Play Games in Mathematics, Volume Three Game Number 10, 11, 17, 22, 46.

C. Addison-Wesley 3, page 105. For more capable children, build a patterned exercise with equations showing both the right and left multiplication-addition (distributive) principles.

Study the pattern and give the numbers.

If 6 x 4 = (4 x 4) + (2 x 4),
then 4 x 6 = (4 x 4) + (4 x ____).

If 8 x 3 = (5 x 3) + (3 x 3),
then 3 x 8 = (3 x 5) + (3 x ____).

If 9 x 5 = (8 x 5) + (1 x 5),
then 5 x 9 = (5 x ____) + (5 x 1).

If 7 x 3 = (3 x 3) + (4 x 3),
then 3 x ____ = (3 x 3) + (3 x 4).

If 8 x 6 = (5 x 6) + (3 x 6),
then 6 x 8 = (6 x ____) + (6 x ____).

D. Houghton Mifflin 3, (1972), p. T325. Students can practice the distributive principle by playing "Mailman." Each student is assigned a multiple as his address for which he makes as many names as he can by using the distributive property. For example, 15 can be written (1 x 5) + (2 x 5), (2 x 3) + (3 x 3), (0 x 5) + (3 x 5), and so on. The names are placed on cards to be delivered as letters. The letters can all be placed in a mailbox and each student can have a turn playing mailman, matching the numbers to the addresses.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 190-193, 209, (63), 252-254, 330-331.
Houghton Mifflin (1972) pp. 253-255, (63), 308-309, (79).
Addison-Wesley (1971, 1968) pp. 102-105, 216-217, 220.

Book: 4

Houghton Mifflin (1967) pp. 98-99, (23).
Houghton Mifflin (1972) pp. 72-73.
Addison-Wesley (1971, 1968) pp. 80-81.

Level: 8 Step: B Concept: Sets 8-15

Text References: Continued

Book: 5

Houghton Mifflin (1967) pp. 102, 229, 320.
Houghton Mifflin (1972) p. 66.

Other References:

Imperial Tapes (Primary), Lesson 28.

*Modern Mathematics, Filmstrip 727.

* Suggested Introductory Activity

8-16 Level: 8 Step: B Concept: Sets

WORKSHEET

SOLVE THE EQUATIONS.

1. 6 x 7 = (6 x 4) + (6 x 3)
= ______ + ______
= ______

2. 7 x 9 = (4 x 9) + (___ x 9)
= ______ + ______
= ______

3. 3 x 5 = (1 x 5) + (___ x 5)
= ______ + ______
= ______

4. 8 x 6 = (6 x 5) + (6 x ___)
= ______ + ______
= ______

5. 4 x 9 = (4 x 4) + (___ x 4)
= ______ + ______
= ______

6. 7 x 5 = (2 x 5) + (5 x 5)
= ______ + ______
= ______

7. 9 x 3 = (5 x 3) + (___ x 3)
= ______ + ______
= ______

8. 8 x 2 = (3 x 2) + (___ x 2)
= ______ + ______
= ______

9. 2 x 10= (2 x 4) + (2 x ___)
= ______ + ______
= ______

10. 3 x 9 = (3 x 3) + (3 x ___)
= ______ + ______
= ______

11. 8 x 7 = (6 x 7) + (___ x 7)
= ______ + ______
= ______

12. 5 x 4 = (4 x ___) + (4 x 3)
= ______ + ______
= ______

13. 9 x 6 = (6 x 6) + (___ x 6)
= ______ + ______
= ______

14. 4 x 6 = (___ x 4) + (2 x 4)
= ______ + ______
= ______

I. Concept:

Numeral: Naming fractional value in fifths, sixths, and eights.

II. Behavioral Objective:

The student given diagrams of fractional values involving fifths, sixths, and eighths, will be able to name the fractional value shown.

III. Mathematical Ideas:

A. A fraction is a name for a fractional number. A fraction is a numeral.

B. A fraction is a symbol for a number pair. A fractional number may be used to compare the cardinal number of one or more subsets with the total set.

C. If a set is separated into equivalent subsets, each of the subsets represents a fractional part of the set.

D. Sets with the same cardinal number are equivalent.

E. The value of fractional subsets of a set are determined by their value in relation to the whole set.

F. The number line may be used to show fractional numbers as well as whole numbers.

IV. Vocabulary To Stress:

fraction
numerator
denominator
fifths
sixths
eighths
equal
one

V. Activities:

*A. Ways fractional parts can be shown:
1. Egg cartons tied with colored yarn can show fractional parts of twelve.
2. Flannel board with cut-outs.
3. Paper can be folded.

*B. Presented with blank outlines of circles, square, or rectangles, the child can divide them into fractional parts.

*C. Five children go to front of room, 1/5 will dance. How many will dance? Give a fraction to tell how many will dance. 2 of these children will clap. Give a fraction to show this.

V. Activities, Continued

D. Children draw pictures of a number of the same items, (5, 6, or 8) and circle fractional parts (fifths, sixths, or eighths) of them.

E. Houghton Mifflin 3, (1972), page T223. To provide enjoyment as well as application of fractions, you may place the following riddles on the board. Explain that the letters in each word are to be used in order.

1. Take 3/4 of JANE, 1/2 of US, 1/3 of ANN, and 2/3 of RYE. What word do you have? (JANUARY)
2. Take 1/5 of JERRY, 1/2 of UP, 1/2 of ME, and 1/4 of PILL. (JUMP)
3. Take 1/3 of COW, 1/2 of IT, 1/4 of RAIN, 1/3 of CAN, and 2/3 of USE. (CIRCUS)

The students can make up riddles of their own, writing each example on a 3 x 5 card for free-time activities.

F. Let's Play Games in Mathematics, Volume Three, Game Number 6, 21, 56, 58, 60, 70.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 160-165, (41), 175.
Houghton Mifflin (1972) pp. 157-165, (39), 181.
Addison-Wesley (1971, 1968) pp. 286-293, 295.

Book: 4

Houghton Mifflin (1967) pp. 128-131, (31), 132-133, (32)
Houghton Mifflin (1972) pp. 126-127, (31), 128-131.
Addison-Wesley (1971, 1968) pp. 252-253 (parts) 257.

Book: 5

Houghton Mifflin (1967) pp. 194-197, (47).
Houghton Mifflin (1972) pp. 126-131.
Addison-Wesley (1971, 1968) pp. 176-183.

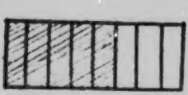
Other References:

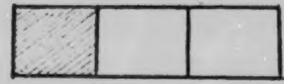
*Modern Mathematics, Filmstrip 732.

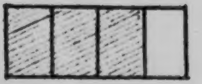
* Suggested Introductory Activity

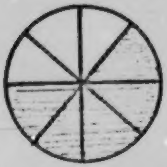
WORKSHEET

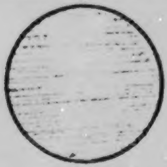
1. Write the fractions for the shaded part of each figure.

a. 

b. 

c. 

d. 

e. 

2. Write a fraction suggested by each of the following sentences.

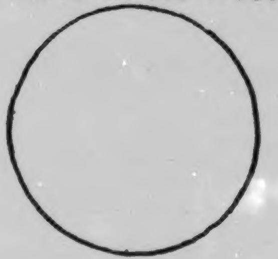
   a. Jan solved 3 out of 5 math problems.

   b. Six out of every eight children passed the test.

   c. Only one out of five kittens had spots.

   d. Ken made four out of six basketball goals.

3. Shade in the fractional part for each shape.



$\frac{3}{8}$

$\frac{5}{6}$

$\frac{3}{5}$

4. Draw a shaded rectangle to show the fractions $\frac{4}{5}$, $\frac{2}{6}$, $\frac{4}{8}$.

8-20 Level: 8 Step: B Concept: Order

I. Concept:

Order: Naming of equivalent fractions.

II. Behavioral Objective:

The student given diagrams or number lines showing fractional value involving halves, thirds, fourths, fifths, sixths, and eighths, as denominators and various numerators will be able to compare fractional numbers.

III. Mathematical Ideas

A. A number line may have fractional numbers assigned to particular points.

B. If a is to the right of b on the number line, then a>b, and b<a. This applies to both fractional and whole numbers.

C. If both a and b occur at exactly the same point on the number-line, then they are equivalent.

IV. Vocabulary To Stress:

fractional number-line
numerator
denominator
greater than " > "
less than " < "
equivalent
equal to " = "

V. Activities:

*A. Ways fractional parts can be shown:

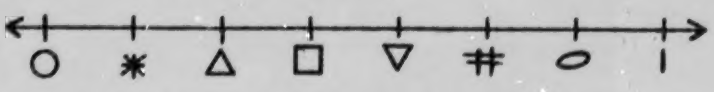
1. Egg cartons tied with colored yarn can be used to show fractional parts of twelve or six.
2. Flannel board with cut-outs.
3. Paper can be folded.

*B. 6 or 8 children go to front of room.
Is 3/6 equal to 1/2? Is 4/8?
How many children would make 1/4? 2/8? 1/8?
Is 1/4 equal to 2/8? 3/8?
Continue with other fractions.

C. Let's Play Games in Mathematics, Volume Three, Game Number 25, 56, 58, 60, 70.

V. Activities: Continued

D. Houghton Mifflin 3, (1972), page T221.
Draw the number line below.



Challenge the students to use it to answer the following questions.

1. Name the fractional number shown by the symbol ✱, ▽, □, and #.
2. Draw the symbols in place of the letter.

   a.. __a__ < □ b. __b__ < # c. __r__ < △

3. Write the symbol that shows 6/7.

E. Write fractions on 3 x 5 cards such as $\boxed{\frac{1}{3}}$, $\boxed{\frac{5}{6}}$, $\boxed{\frac{2}{6}}$, etc. Pass out the cards, one to each student. Ask the students to arrange themselves in a "human" number line. Students holding equivalent fractions will have to stand behind one another.

F. Houghton Mifflin 3 (1972), page T229. You may challenge students to put the following fractions in order and solve the secret code (great work). Each fraction represents the letter beneath it.

$\frac{4}{5}$	$\frac{2}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{5}$	$\frac{2}{5}$
K	O	R	G	E	R	T	W	A

Text References:

Book: 3

Houghton Mifflin (1967) pp. 168-171, (43, 44), 294-295.
Houghton Mifflin (1972) pp. 141, 166-169, (41), 170-171, (42), 186-187,
Extra Practice 327.
Addison-Wesley (1971, 1968) pp. 292-293, 295.

Book: 4

Houghton Mifflin (1967) pp. 138, (35), 140-141, (36).
Houghton Mifflin (1972) pp. 136-139, (34)
Addison-Wesley (1971, 1968) pp. 262-265.

Text References, Continued

Book: 5

Houghton Mifflin (1967) pp. 208-212, 234.
Houghton Mifflin (1972) pp. 148-150, 194, 196, 198.
Addison-Wesley (1971, 1968) pp. 186, 188-191, 194.

Other References:

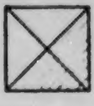
Modern Mathematics, Filmstrip 732.

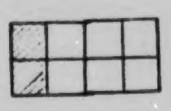
* Suggested Introductory Activity

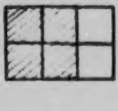
Level: 8 Step: B Concept: Order 8-23

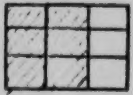
WORKSHEET

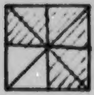
WRITE TWO FRACTIONS FOR THE SHADED PART OF EACH REGION.

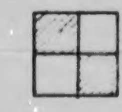

1. ___ = ___

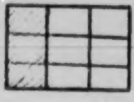

2. ___ = ___


3. ___ = ___


4. ___ = ___


5. ___ = ___


6. ___ = ___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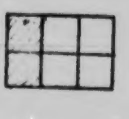
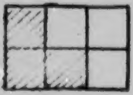
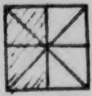
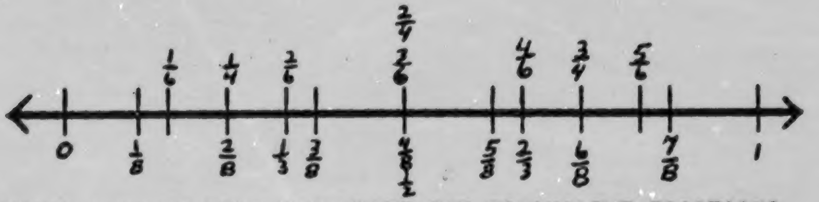

8. ___ = ___


9. ___ = ___


10. ___ = ___



USE THE NUMBER LINE TO HELP YOU WRITE THE EQUIVALENT FRACTIONS.

11. $\frac{2}{6} =$ ___

12. $\frac{3}{4} =$ ___

13. $\frac{1}{2} = \frac{\_\_}{8}$

14. $\frac{2}{8} =$ ___

15. $\frac{4}{6} =$ ___

WRITE " > ", " < ", OR " = " IN THE $\bigcirc$.

16. $\frac{1}{6} \bigcirc \frac{2}{3}$

17. $\frac{1}{3} \bigcirc \frac{1}{4}$

18. $\frac{2}{3} \bigcirc \frac{3}{4}$

19. $\frac{7}{8} \bigcirc \frac{5}{6}$

20. $\frac{2}{6} \bigcirc \frac{1}{3}$

21. $\frac{3}{8} \bigcirc \frac{4}{6}$

22. $\frac{3}{6} \bigcirc \frac{4}{8}$

23. $\frac{1}{4} \bigcirc \frac{1}{8}$

24. $\frac{1}{8} \bigcirc \frac{1}{6}$

25. $\frac{4}{6} \bigcirc \frac{7}{8}$

26. $\frac{1}{4} \bigcirc \frac{2}{8}$

27. $\frac{3}{8} \bigcirc \frac{1}{3}$

28. $\frac{2}{4} \bigcirc \frac{1}{2}$

29. $\frac{6}{8} \bigcirc \frac{4}{6}$

30. $\frac{1}{6} \bigcirc \frac{2}{8}$

8-24 Level: 8 Step: B Concept: Multiplication & Division

I. Concept:

Solving word problems involving multiplication and division with products not greater than 81.

II. Behavioral Objective:

The student given multiplication and division word problems involving products up to 81 will be able to determine the operation and solve the problem.

III. Mathematical Ideas:

A. In multiplication the factors are commutative.

B. Multiplication is the renaming of two factors as a product.

C. Multiplication is repeated addition.

D. Multiplication is the inverse of division.

E. Multiplication is the joining of equivalent sets.

F. Division is the inverse of multiplication.

G. Division is the renaming of the product and one factor with a missing factor.

H. Division is separation of a set into equivalent subsets.

I. Division is repeated subtraction.

J. Word problems require finding another name for the cardinal number of the sets in the problem.

K. Mathematical thinking involves identifying the sets and distinguishing between joining and separating the sets.

IV. Vocabulary To Stress:

factor
product
multiplication

division
divided by (÷) (⟌)
times (x)

equal
joining
separating

V. Activities:

*A. Egg cartons can be used as arrays to show factors in multiplication.

*B. The teacher can provide grocery sale advertisements or sports pages from recent newspapers for the children to use in making up word problems, such as:

> There were 4 runners on each relay team. If there were 8 teams, how many runners are there in all?

V. Activities: Continued

C. The teacher can dictate word problems to children, especially if they have reading problems.

D. The five-step method can be used by the children for solving word problems.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 149, 202, 203, (53), 235.
Houghton Mifflin (1972) pp. 202-204.
Addison-Wesley (1971, 1968) pp. 90-91, 93, 116-117, 119, 139, 143, 154-155 157, 159, 163, (37).

Book: 4

Houghton Mifflin (1967) pp. 110, 111, 113, 114, (28).
Houghton Mifflin (1972) pp. 64-65, 80-81, (21).
Addison-Wesley (1971, 1968) pp. 77, 87, 97, 99, (25).

Other References:

Countdown (Economy Company) Tapes and Lessons 45-50.

* Suggested Introductory Activity

8-26 Level: 8 Step: B Concept: Multiplication & Division

WORKSHEET: SETS

DETERMINE THE OPERATION AND SOLVE THE PROBLEM.

1. Mary bought 6 cookies. The cookies cost 9¢ each. How much did Mary pay for the 6 cookies?

2. Linda is collecting shells. She keeps the shells in a frame. She had 8 rows with 9 shells in each row. How many shells does Linda have?

3. If John has 7 rows of cars with 9 cars in each row, how many cars does he have?

4. Bill went on a bike ride. He went 56 miles in 7 hours. How many miles did he go in each hour?

5. Sue baked cookies. She made 8 rows with 8 cookies in each row. How many cookies did she make?

6. Lucy can iron a shirt in 9 minutes. How many shirts can she iron in 72 minutes?

7. Sam had 9 packages of bubble gum. There were 7 pieces of gum in each package. How many pieces of bubble gum does Sam have?

8. Donna has picked 54 roses. She wants to give them away equally to 6 friends. How many roses will each of her friends get?

9. Sam went on vacation with his family. He took 9 rolls of film. There were 8 pictures on each roll of film. How many pictures did Sam take?

10. Denny wants to plant 81 cabbage plants. He wants to put them into 9 equal rows. How many plants will he have in each row?

11. If one quart of orange drink costs 9 cents, how much would you have to pay for 5 quarts?

I. Concept:

Geometry: Measureing the area of a region.

II. Behavioral Objective:

The student given regions and a standard unit of measure will be able to find the measure of the regions.

III. Mathematical Ideas:

A. Area is the measure of a region.

B. Area may be found by comparing a square unit with the space inside the region.

C. The measure of area is a number which tells how many square units match the object or region.

D. A square inch is a standard unit of measure with each side of a square equal to one inch in length.

E. A square foot is a standard unit of measure with each side of a square equal to one foot in length.

F. A square yard is a standard unit of measure with each side of a square equal to one yard in length.

IV. Vocabulary To Stress:

region
standard unit
measure
area
square inch
square foot
square yard

V. Activities:

A. Let's Play Games in Mathematics, Volume Four, Game Number 66.

*B. Houghton Mifflin Geoboard Activity Cards. Geocard 21, 22, 30, 31, 32, 33, 36, 37.

*C. To teach area using the square inch as the unit of measure, use 1 inch squared paper.

8-28 Level: 8 Step: B Concept: Geometry

Text References:

Book: 3

Houghton Mifflin (1967) pp. 88-89, (25), 154-155, 236-237.
Houghton Mifflin (1972) pp. 116-117, (30), 290-291.
Addison Wesley (1971, 1968) pp. 178-181.

Book: 4

Houghton Mifflin (1967) pp. 88-90, (19), 267.
Houghton Mifflin (1962) pp. 114-116, 288.
Addison-Wesley (1971, 1968) pp. 118-121, 174.

Book: 5

Houghton Mifflin (1967) pp. 88-89.

Other References:

Franklin Series, Learning About Measurement, pp. 20-32.

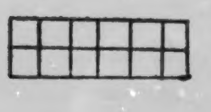
Franklin Series, Paper and Pencil Geometry, pp. 75-78.

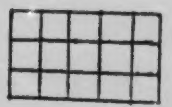
* Suggested Introductory Activity

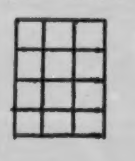
Level: 8 Step: B Concept: Geometry 8-29

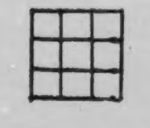
WORKSHEET: AREA

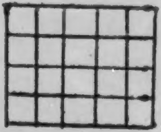
NAME AREA USING SQUARE INCHES. EACH SQUARE UNIT REPRESENTS 1 SQUARE INCH.

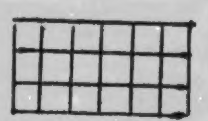

1. ______

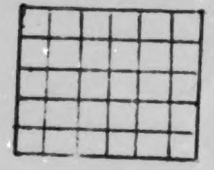

2. ______

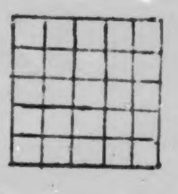

3. ______

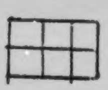

4. ______

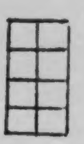

5. ______

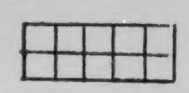

6. ______

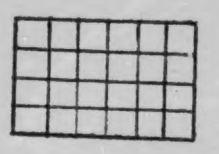

7. ______


8. ______

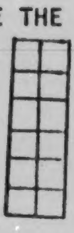

9. ______

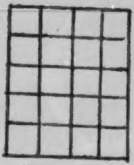

10. ______

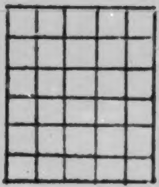

11. ______

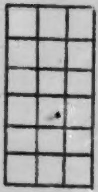

12. ______

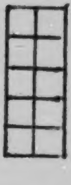
NAME THE AREA USING SQUARE FEET. EACH SQUARE UNIT REPRESENTS 1 SQUARE FOOT.

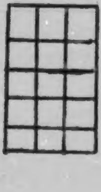

13. ______

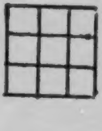

14. ______

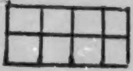

15. ______


16. ______

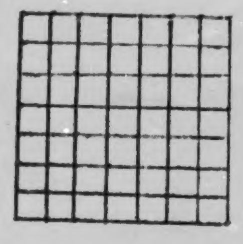

17. ______

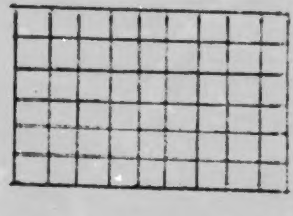

18. ______

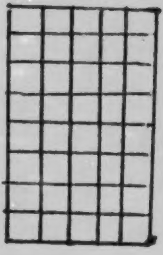

19. ______

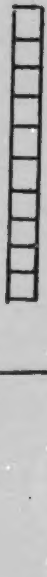

20. ______

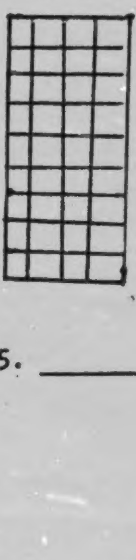
NAME THE AREA USING SQUARE YEARDS. EACH SQUARE UNIT REPRESENTS 1 SQUARE YARD.


21. ______


22. ______


23. ______


24. ______


25. ______

WORKSHEET: AREA

FIND THE AREA IN SQUARE INCHES, SQUARE FEET, OR SQUARE YARDS. DRAW A DIAGRAM IF YOU FIND IT NECESSARY.

1. Jane wanted to cover the top of her desk at home with new paper. If the desk is 15 inches wide and 9 inches long, how many square inches of paper must she buy to cover it?

2. John wanted part of his father's workshop to set up his Hotwheels racing track. How many square feet of space does he need if the track covers a space 6 feet wide and 10 feet long?

3. Mr. Jones' backyard was 9 yards long and 20 yards wide. What is the area of his backyard?

4. A swimming pool is 13 feet long and 8 feet wide. How many square feet are in the bottom of the pool?

5. The table was 6 feet wide and 8 feet long. What was the area of the table?

6. The chalkboard is 15 feet long and 3 feet high. What is the area of the chalkboard?

7. The paper is 11 inches long and 8 inches wide. What is the area of the paper?

8. A board was 7 inches high and 8 inches wide. What is the area of the board?

Level: 8 Step: B Concept: Measurement 8-31

I. Concept:

Measurement: Using inches, feet, yards and dozen in measurement.

II. Behavioral Objective:

The student given measurement problems involving inches, feet, yards, and dozen will be able to express one measurement in terms of 2 different units.

III. Mathematical Ideas:

A. Measurement involves a comparison between a standard unit and the object being measured. The measure of an object is expressed as a number which indicates how many of the standard units are contained in the object.

B. One foot is equivalent to 12 inches; one yard is equivalent to 3 feet.

C. One dozen is equivalent to 12 ones.

IV. Vocabulary To Stress:

inch (") foot (') yard dozen measure

V. Activities:

A. Let's Play Games in Mathematics, Volume Three, Game No. 23 and 57.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 214-215.
Houghton Mifflin (1972) pp. 108-109, 214-215, (56).
Addison-Wesley (1971, 1968) p. 171.

Book: 4

Addison-Wesley (1971, 1968) p. 129.

Other References:

Franklin Series, Learning About Measurement, pp. 12-14.

*Modern Mathematics, Filmstrips 733: 15-32 717: 1-20

* Suggested Introductory Activity

8-32 Level: 8 Step: B Concept: Measurement

WORKSHEET

WHICH IS LONGER? CIRCLE IT.

1. 1 foot 2 inches or 16 inches
2. 23 inches or 2 feet
3. 2 ft. 3 inches or 26 inches
4. 14 inches or 1 ft. 3 inches
5. 2 ft. 6 inches or 26 inches
6. 2 feet or 1 yard
7. 3 yards or 10 feet
8. 2 ft. 5 inches or 28 inches
9. 3 ft. or 37 inches
10. 48 inches or 3 ft. 11 inches
11. 18 inches or 1 ft. 7 inches
12. 2 ft. 4 inches or 29 inches
13. 3 inches or 1 yard
14. 27 inches or 1 yard

NAME THE NUMBER OF FEET IN:

15. 24 inches ________
16. 6 yards ________
17. 2 yards ________
18. 36 inches ________
19. 7 yards ________
20. 5 yards ________
21. 3 yards ________
22. 48 inches ________
23. 9 yards ________
24. 4 yards ________

NAME THE NUMBER OF YARDS IN:

25. 6 feet ________
26. 36 feet ________
27. 18 feet ________
28. 9 feet ________
29. 15 feet ________
30. 36 inches ________
31. 21 feet ________
32. 12 feet ________
33. 24 feet ________
34. 30 feet ________

NAME THE NUMBER OF EGGS IN:

35. 1 dozen ________
36. 3 dozen ________
37. $1\frac{1}{2}$ dozen ________
38. 2 dozen ________
39. 5 dozen ________
40. 8 dozen ________

I. Concept:

Numeral: Naming place value to millions.

II. Behavioral Objective:

The student given any five, six, or seven-digit numeral will be able to name the place value of each digit.

III. Mathematical Ideas:

A. Ten is the base of our number system.

B. A digit in any place has ten times the value of the digit to its right.

C. The fifth digit from the right is the ten-thousands' place.

D. The sixth digit from the right is the hundred-thousands' place.

E. The seventh digit from the right is the millions' place.

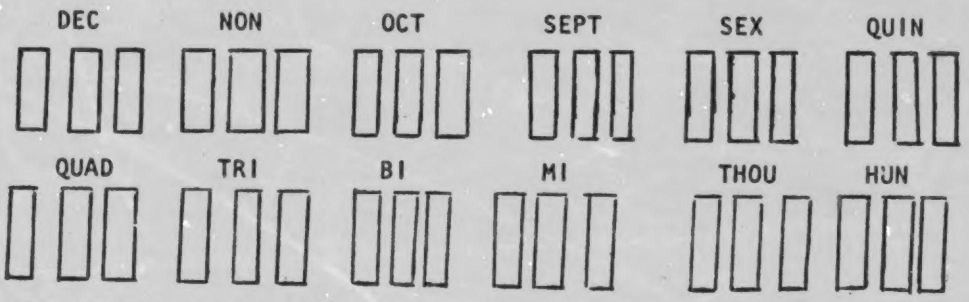
IV. Vocabulary To Stress:

hundred
thousand
million
expanded numeral
column
digit

V. **Activities**

*A. Give children practice writing large numerals by dictating them.

*B. This is a diagram to help children read numerals which represent greater magnitudes. After the two periods on the right, hundreds and thousands, we add the expression "illions" to each prefix. The names sometimes help to keep the "big ones" straight.



C. Let's Play Games in Mathematics, Volume Three, Game Number 26, 35, 52, 65.

D. Let's Play Game in Mathematics, Volume Four, Game Number 11, 33, 36, 60.

8-34 Level: 8 Step: C Concept: Numeral

Text References:

Book: 3

Houghton Mifflin (1967) pp. 26-27, 240-245, (62)
Houghton Mifflin (1972) pp. 242-245, (61), 317.
Addison-Wesley (1971, 1968) pp. 14-18.

Book: 4

Houghton Mifflin (1967) pp. 17-20, (5), 21, 24.
Houghton Mifflin (1972) pp. 16, 20-23, (6).
Addison Wesley (1971, 1968) pp. 12-14.

Book: 5

Addison-Wesley (1971,1968) pp. 1-9.

Other References:

Imperial Tapes, (Intermediate), #2.

* Suggested Introductory Activity

WORKSHEET

WRITE NUMERALS FOR:

1. 20,000 + 1,000 + 600 + 10 + 7 ____________

2. Sixty thousand, three hundred seventy-two ____________

3. Four million ____________

4. 9,000,000 + 60,000 + 10 ____________

5. Fourty-nine thousand, five ____________

6. 8,000,000 + 600,000 + 10,000 + 9,000 + 700 + 20 + 3 ____________

7. Nine hundred two thousand, six hundred ____________

8. 500,000 + 1,000 + 400 + 30 + 9 ____________

9. 30,000 + 9,000 + 600 + 50 ____________

10. Five hundred twenty-five thousand ____________

WRITE THE NUMERALS BELOW IN THE EXPANDED FORM.

11. 2,753,149 ____________

12. 830,452 ____________

13. 6,030,428 ____________

14. 567,041 ____________

15. 1,203,560 ____________

16. Which digit is in the millions' place? 3,547,891 ____________

17. Which digit is in the hundred thousands' place? 1,258,903 ____________

18. Which digit is in the ten thousands' place? 735,642 ____________

19. Which digit is in the one thousands' place? 628,735 ____________

20. Which digit is in the millions' place? 5,789,324 ____________

WRITE THE TOTAL VALUE IN WORDS FOR EACH OF THE NUMBERS INDICATED. 8,754,263

21. 5 ____________

22. 8 ____________

23. 7 ____________

24. 2 ____________

I. Concetp:

Order: Extending the understanding of greater than and less than to five-digit, six-digit, and seven-digit numerals.

II. Behavioral Objective:

The student given random numbers in the set 0 - 9,999,999 will be able to name the symbols which show greater than, less than or equal value.

III. Mathematical Ideas:

A. On a number-line, the number to the right is greater. The number to the left is less.

B. The symbol for greater than is >.

C. The symbol for less than is <.

D. The symbol for "is equal to" is " = ".

E. The symbol for "is not equal to" is " ≠ ".

IV. Vocabulary To Stress:

greater than less than between equal

V. Activities

A. Let's Play Games in Mathematics, Volume Four, Game Number 25, 33, 45, 60.

Text References:

Book: 3

Houghton Mifflin (1967) p. 244.
Addison-Wesley (1971, 1968) pp. 18, 19,(#7), 67, 80,(#1), 81,(#7).

Book: 4

Addison-Wesley (1971, 1968) pp. 8-9.

Book: 5

Addison-Wesley (1971, 1968) pp. 7-8.

Level: 8 Step: C Concept: Order

WORKSHEET

REARRANGE THE NUMBERS FROM LEAST TO GREATEST.

1. 699, 52, 1683, 200 ________________________________

2. 3449, 614, 8243, 355 ________________________________

3. 5654, 5454, 5154, 5954 ________________________________

4. 8276, 8216, 8246, 8236 ________________________________

5. 529, 5280, 592, 2085 ________________________________

6. 7920, 7990, 7290, 7092 ________________________________

7. 6498, 6500, 60050, 65000 ________________________________

8. 3999, 4100, 4010, 4009 ________________________________

9. 95151, 59515, 55915, 91515 ________________________________

10. 44100, 44200, 44000, 44010 ________________________________

11. 13010, 13100, 13001, 11300 ________________________________

12. 29950, 20995, 25990, 29590 ________________________________

WRITE " > ", " < ", OR " = " IN THE BLANK.

13. 359,642 ____ 440,819

14. 48,205 ____ 48,250

15. 3,090,601 ____ 6,039,000

16. 605,000 ____ 605,000

17. 731,265 ____ 713,625

18. 41,823 ____ 40,989

19. 6,756,290 ____ 6,756,291

20. 84,502 ____ 48,520

21. 1,246,950 ____ 2,146,590

22. 75,601 ____ 75,601

23. 650,200 ____ 680,200

24. 4,936,750 ____ 4,826,570

25. 224,070 ____ 424,060

26. 99,000 ____ 90,000

27. 34,826 ____ 28,427

28. 1,000,000 ____ 100,000

29. 671,485 ____ 716,390

30. 7,000,000 ____ 7,000,000

8-38 Level: 8 Step: C Concept: Multiplication

I. Concept:

Multiplication: Naming multiples of a given factor.

II. Behavioral Objective:

The student given a factor will be able to name the multiples of that factor up to a given multiple.

III. Mathematical Ideas:

A. A product is a multiple of any of its factors.

B. Zero is a multiple of any number because the product of zero and any number is zero.

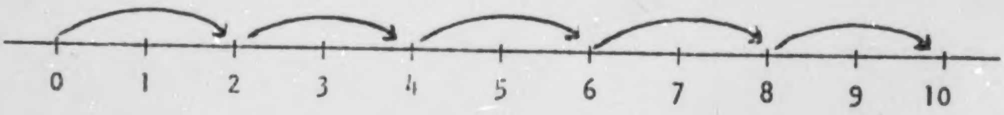
C. Multiplication is a short method of adding equal addends. This fact may be used to name multiples.

IV. Vocabulary To Stress: zero multiple

V. Activities:

*A. The teacher can put a commercial number line up within the child's reach and let the child cut a strip of construction paper the length of a given number of units the same as that used on the number line. For example, if you want a child to name the multiples of 6, have him cut a strip of paper 6 units long. He starts at 0 and the strip ends at 6. He picks it up, starts at 6 and the strip ends at 12, etc., thereby naming the multiples of 6. The length of strips can vary according to the number for which you are naming multiples.

B. The child can be given a ditto with a number line on it. He shows the multiples of a number by drawing arrows, such as:



*C. "Building A Skyscraper" or "You Too Can Become A Sidewalk Superintendent." Needed: One piece of construction paper or one sheet of lined notebook paper for skyscraper, one smaller piece of colored paper to be cut into smaller (1/4 inch to 1/2 inch) squares or rectangles for windows. (Fold paper vertically, so as to form the two sides for the skyscraper. It must be wide enough to accommodate the multiples of windows.)

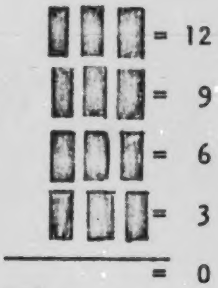
V. Activities: Continued

C. (continued) Children may get a better understanding of multiples by "building a skyscraper." The teacher will explain that a skyscraper is going to be built.

Teacher: "Today we will all be promoted to "sidewalk superintendents." Do you know what a sidewalk superintendent does? (He watches from the sidewalk through a knothole in the fence while the building is being built.) At first there is nothing but a big hole in the ground, and a skyscraper basement will have no windows because it's below ground. So, let's dig a big hole and write a zero below the sidewalk, here."

If 3 windows (multiples of 3) are decided upon, the children will paste 3 small squares horizontally to form the first story, leaving room for the imaginary basement. They will then build the skyscraper by adding stories (multiples), working upward from the foundation.

Emphasize: multiplication is repeated addition
understanding multiples
finding multiples



*D. To name multiples play "Buzz." (Houghton Mifflin 3, (1972), page T349). Students count consecutively, taking turns around the circle or up and down the rows. Whenever a multiple of the factor is named, they say "Buzz" instead of the number. For example, if you are naming multiples of 6, they say: Buzz 1, 2, 3, 4, 5, Buzz, 7, 8, 9, 10, 11, Buzz, and so on.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 224-225, (58), 228, 229.
Houghton Mifflin (1972) pp. 278-279, (71).
Addison-Wesley (1971, 1968) p. 201.

Book: 4

Houghton Mifflin (1967) pp. 194-199.
Houghton Mifflin (1972) pp. 160-161.

Book: 5

Addison-Wesley (1971, 1968)
pp. 23, 24, 25.

* Suggested Introductory Activity

WORKSHEET

1. Write the multiples of 2 to 20.

{ 0, ___, ___, ___, ___, ___, ___, ___, ___, ___, ___ }

2. Write the multiples of 4 to 40.

{ ___, ___, ___, ___, ___, ___, ___, ___, ___, ___, ___ }

3. Write the multiples of 6 to 54

{ ___, 6, ___, ___, ___, ___, ___, ___, ___, ___ }

4. Write the multiples of 5 to 50.

{ 0, ___, ___, ___, ___, ___, ___, ___, ___, ___, ___ }

5. Write the multiples of 7 to 63.

{ ___, ___, ___, ___, ___, ___, ___, ___, ___, ___ }

6. Write the multiples of 9 to 81.

{ ___, ___, ___, ___, ___, ___, ___, ___, ___, ___ }

7. 35 is a multiple of 5. Name the next two multiples of 5. ___ ___

8. 24 is a multiple of 8. Name the two multiples of 8 that come just before 24. ___ ___

9. 36 is a multiple of 6. Name the next two multiples of 6. ___ ___

10. 49 is a multiple of 7. Name the two multiples of 7 just before 49. ___ ___

11. Name the next six multiples of 8. { 32, ___, ___, ___, ___, ___, ___ }

12. Name the next seven multiples of 5. { 25, ___, ___, ___, ___, ___, ___, ___ }

13. Name the next eight multiples of 4.
{12, ___, ___, ___, ___, ___, ___, ___, ___ }

14. Name the next six multiples of 9. { 18, ___, ___, ___, ___, ___, ___ }

I. Concept:

Division: Finding factors of a product.

II. Behavioral Objective:

The student given products less than 50 will be able to name their factors.

III. Mathematical Ideas:

A. When two numbers are multiplied to give a product, the numbers are called factors of the product.

B. One is a factor of any counting number, because 1 times any number equals that number.

C. Multiplication is the process of renaming two factors as a product.

D. All the factors of a product can be written as a set.

IV. Vocabulary To Stress: factors product one itself set

V. Activities:

A. Let's Play Games in Mathematics, Volume Four, Game Number 10, 28, 52, 58, 64.

B. Addison-Wesley 3, page 203. An activity for more capable children would be for them to find three factors whose product is a given number. List numbers such as 12, 18, 24, 30, 36 on the chalkboard, and have the children find as many different sets of three factors for each number as they can. For example:

12 = (2 x 2 x 3) or (1 x 4 x 3) or (1 x 2 x 6)
18 = (2 x 3 x 3) or (1 x 2 x 9) or (1 x 3 x 6)
24 = (2 x 3 x 4) or (1 x 3 x 8) or (1 x 4 x 6) or (1 x 2 x 12)
30 = (1 x 2 x 15) or (2 x 3 x 5) or (1 x 3 x 10) or (1 x 6 x 5)
36 = (1 x 2 x 18) or (2 x 2 x 9) or (1 x 4 x 9) or (4 x 3 x 3) or
(1 x 3 x 12) or (1 x 6 x 6) or (2 x 3 x 6)

Text References:

Book: 3

Houghton Mifflin (1967) pp. 230-231, (60).
Addison-Wesley (1971, 1968) pp. 202-203, 207.

Book: 4

Houghton Mifflin (1967) p. 199.
Houghton Mifflin (1972) p. 164.
Addison-Wesley (1971, 1968) p. 235, #3 & 4.

Book: 5

Houghton Mifflin (1967) p. 164.
Houghton Mifflin (1972) pp. 61, 62, 158.

8-42 Level: 8 Step: C Concept: Division

WORKSHEET

1. Name the factors of 8. ______________________________
2. Name the factors of 12. ______________________________
3. Name the factors of 24. ______________________________
4. Name the factors of 20. ______________________________
5. Name the factors of 36. ______________________________
6. Name the factors of 10. ______________________________
7. Name the factors of 15. ______________________________
8. Name the factors of 21. ______________________________
9. Name the factors of 28. ______________________________
10. Name the factors of 42. ______________________________
11. Name the factors of 16. ______________________________
12. Name the factors of 25. ______________________________
13. Name the factors of 48. ______________________________
14. Name the factors of 18. ______________________________
15. Name the factors of 14. ______________________________
16. Name the factors of 6. ______________________________
17. Name the factors of 9. ______________________________
18. Name the factors of 27. ______________________________

8-2 Sets

1. 6
2. 2
3. 9
4. 0
5. 20
6. 5
7. 9
8. 5
9. 4
10. 5
11. 4
12. 3
13. 9
14. 6
15. 9
16. 4
17. 3
18. 8
19. 6
20. 7
21. 4
22. 1
23. 5
24. 9
25. 4
26. 10
27. 8
28. 9
29. 7
30. 8
31. 7
32. 5
33. 2
34. 7
35. 0
36. 3
37. 2
28. 8
39. 1
40. 6,0

8-6 Division

1. 9, 18, 6, 48, 56, 50
2. 9, 36, 6, 48, 40, 50
3. 9, 3, 27, 18, 25, 16
4. 6, 36, 4, 32, 26, 34
5. 7, 7, 42, 7, 16, 7
6. 8, 2, 18, 3, 24, 6
7. 8, 64, 56, 63, 54, 47
8. 6, 18, 2, 14, 23, 16
9. 7, 56, 48, 39, 44, 36

8-10 Geometry

1. Q
2. NQ
3. Q
4. NQ
5. NQ
6. Q
7. NQ
8. Q
9. Q
10. NQ
11. triangle
12. parallelogram
13. square
14. rectangle
15. quadrilateral

8-12 Measurement

1. 15, 12
   12:15
2. 40, 3
   3:40
3. 5, 3
   2:55
4. 10, 5
   5:10
5. 25, 7
   7:25
6. 15, 7
   6:45

8-16 Sets

1. 24, 18, 42
2. 3, 36, 27, 63
3. 2, 5, 10, 15
4. 3, 30, 18, 48
5. 5, 16, 20, 36
6. 10, 25, 35
7. 4, 15, 12, 27
8. 5, 6, 10, 16
9. 6, 8, 12, 20
10. 6, 9, 18, 27
11. 2, 42, 14, 56
12. 2, 8, 12, 20
13. 3, 36, 18, 54
14. 4, 16, 8, 24

8-19 Numeral

1. a. 5/8
   b. 1/3
   c. 3/4
   d. 5/8
   e. 2/2 or 1
2. a. 3/5
   b. 6/8
   c. 1/5
   d. 4/6

8-23 Order

1. 1/2, 2/4
2. 1/4, 2/8
3. 2/3, 4/6
4. 2/3, 6/9
5. 3/4, 6/8
6. 1/2, 2/4
7. 1/3, 3/9
8. 1/3, 2/6
9. 1/2, 3/6
10. 1/2, 4/8
11. 1/3
12. 6/8
13. 4
14. 1/4
15. 2/3
16. <
17. >
18. <
19. >
20. =
21. <
22. =
23. >
24. <
25. <
26. =
27. >
28. =
29. >
30. <

8-26 Multiplication and Division

1. 54¢
2. 72 shells
3. 63 cars
4. 8 miles
5. 64 cookies
6. 8 shirts
7. 63 pieces of gum
8. 9 roses
9. 72 pictures
10. 9 plants
11. 45¢

8-29 Geometry

1. 12 sq. in.
2. 15 sq. in.
3. 12 sq. in.
4. 9 sq. in.
5. 20 sq. in.
6. 18 sq. in.
7. 30 sq. in.
8. 25 sq. in.
9. 6 sq. in.
10. 8 sq. in.
11. 10 sq. in.
12. 24 sq. in.
13. 12 sq. ft.
14. 20 sq. ft
15. 30 sq. ft
16. 18 sq. ft.
17. 10 sq. ft.
18. 15 sq. ft.
19. 9 sq. ft.
20. 8 sq. ft
21. 49 sq. yd.
22. 54 sq. yd.
23. 40 sq. yd.
24. 10 sq. yd.
25. 36 sq. yd.

8-30 Geometry

1. 135 sq. in.
2. 60 sq. ft.
3. 180 sq. yd.
4. 104 sq. ft.
5. 48 sq. ft.
6. 45 sq. ft.
7. 88 sq. in.
8. 56 sq. in.

8-32 Measurement

1. 16 in.
2. 2 ft.
3. 2 ft. 3 in.
4. 1 ft. 3 in.
5. 2 ft. 6 in.
6. 1 yd.
7. 10 ft.
8. 2 ft. 5 in.
9. 37 in.
10. 3 ft. 11 in.
11. 1 ft. 7 in.
12. 29 in.
13. 1 yd.
14. 1 yd.
15. 2 ft.
16. 18 ft.
17. 6 ft.
18. 3 ft.
19. 21 ft.
20. 15 ft.
21. 9 ft.
22. 4 ft.
23. 27 ft.
24. 12 ft.
25. 2 yd.
36. 12 yd.
27. 6 yd.
28. 3 yd.
29. 5 yd.
30. 3 yd.
31. 7 yd.
32. 4 yd.
33. 8 yd.
34. 10 yd.
35. 12
36. 36
37. 18
38. 24
39. 60
40. 96

8-35 Numeral

1. 21,617
2. 60,372
3. 4,000,000
4. 9,060,010
5. 49,005
6. 8,619,723
7. 902,600
8. 501,439
9. 39,650
10. 525,000
11. 2,000,000 + 700,000 + 50,000 + 3,000 + 100 + 40 + 9
12. 800,000 + 30,000 + 400 + 50 + 2
13. 6,000,000 + 30,000 + 400 + 20 + 8
14. 500,000 + 60,000 + 7,000 + 40 + 1
15. 1,000,000 + 200,000 + 3,000 + 500 + 60
16. 3
17. 2
18. 3
19. 8
20. 5
21. Five ten thousands or Fifty thousand
22. Eight million
23. Seven hundred thousand
24. Two hundred

8-37 Order

1. 52, 200, 699, 1,683
2. 355, 614, 3,449, 8,243
3. 5,154, 5,454, 5,654, 5,954
4. 8,216, 8,236, 8,246, 8,276
5. 529, 592, 2,085, 5,280
6. 7,092, 7,290, 7,920, 7,990
7. 6,498, 6,500, 60,050, 65,000
8. 3,999, 4,009, 4,010, 4,100
9. 55,915, 59,515, 91,515, 95,151
10. 44,000, 44,010, 44,100, 44,200
11. 11,300, 13,001, 13,010, 13,100
12. 20,995, 25,990, 29,590, 29,950
13. <
14. <
15. <
16. =
17. >
18. >
19. <
20. >
21. <
22. =
23. <
24. >
25. <
26. >
27. >
28. >
29. <
30. =

8-40 Multiplication

1. 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
2. 0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40
3. 0, 12, 18, 24, 30, 36, 42, 48, 54
4. 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
5. 0, 7, 14, 21, 28, 35, 42, 49, 56, 63
6. 0, 9, 18, 27, 36, 45, 54, 63, 72, 81
7. 40, 45
8. 8, 16
9. 42, 48
10. 35, 42
11. 40, 48, 56, 64, 72, 80
12. 30, 35, 40, 45, 50, 55, 60
13. 16, 20, 24, 28, 32, 36, 40, 44
14. 27, 36, 45, 54, 63, 72

8-42 Division

1. 8, 1, 2, 4
2. 1, 12, 2, 6, 3, 4
3. 1, 24, 2, 12, 3, 8, 4, 6
4. 1, 20, 2, 10, 4, 5
5. 1, 36, 6, 4, 9, 12, 3
6. 1, 10, 2, 5
7. 1, 15, 3, 5
8. 1, 21, 3, 7
9. 1, 28, 2, 14, 4, 7
10. 1, 42, 2, 21, 6, 7, 3, 14
11. 1, 16, 2, 8, 4
12. 1, 25, 5
13. 1, 48, 2, 24, 3, 16, 4, 12, 6, 8
14. 1, 18, 2, 9, 3, 6
15. 1, 14, 2, 7
16. 1, 6, 2, 3
17. 1, 9, 3
18. 1, 27, 3, 9

Answer Key - Step A

Multiplication Facts

1. 40
2. 36
3. 48
4. 45
5. 0
6. 32
7. 56
8. 27
9. 48
10. 81
11. 16
12. 54
13. 18
14. 24
15. 56
16. 16
17. 36
18. 40
19. 54
20. 72
21. 32
22. 27
23. 63
24. 45
25. 72
26. 8
27. 64
28. 63
29. 18
30. 24

Division Facts

1. 9
2. 8
3. 8
4. 5
5. 2
6. 9
7. 8
8. 9
9. 8
10. 9
11. 8
12. 4
13. 7
14. 3
15. 1
16. 3
17. 9
18. 9
19. 8
20. 9
21. 5
22. 9
23. 6
24. 7
25. 9
26. 8
27. 2
28. 8
29. 4
30. 6

POST TEST I

Answer Key

Step A

Sets

1. 9
2. 3
3. 6
4. 1
5. 6

Multiplication

6. 81
7. 48
8. 27
9. 54
10. 64
11. 63
12. 24
13. 32
14. 49
15. 40
16. 72
17. 56
18. 36
19. 45
20. 56

Division

21. 9
22. 8
23. 3
24. 9
25. 8
26. 7
27. 3
28. 4
29. 7
30. 8
31. 9
32. 7
33. 4
34. 5
35. 8

Geometry

36. quadrilateral
37. rectangle
38. square
39. parallelogram
40. triangle

Measurement

41. 7:00
42. 8:30
43. 6:25
44. 3:35
45. 11:45

Step B

Sets

46. 3, 24
47. 5, 36
48. 3, 14
49. 6, 45
50. 3, 21

Numeral

51. 2/5
52. 5/6
53. 3/8
54. 1/5
55. 5/8

Order

56. <
57. =
58. >
59. <
60. =

Multiplication-Division

Each problem is worth 2 points, 1 point for determining the correct operation and 1 point for finding the correct answer.

61. multiply, 36 miles
62. divide, 7¢
63. divide, 9 miles
64. multiply, 48 cookies
65. divide, 9¢
66. divide, 9 candy bars
67. multiply, 63 balloons
68. divide, 9 stamps
69. multiply, 64 pieces of candy
70. multiply, 54 pieces of fudge

Step B

Geometry

71. 8
72. 32
73. 15
74. 25
75. 36

Measurement

76. 3 ft.
77. 15 ft.
78. 2 yd.
79. 7 yd.
80. 24 eggs

Step C

Numeral

81. 9
82. 2
83. 0
84. 5
85. 8

Order

86. >
87. >
88. <
89. =
90. <

Multiplication

91. 0, 6, 12, 18, 24, 30
92. 0, 3, 6, 9, 12, 15, 18, 21
93. 76, 80
94. 70, 75
95. 49

Step C

Division

96. 1, 6, 2, 3
97. 1, 10, 2, 5
98. 1, 12, 2, 6, 3, 4
99. 1, 15, 3, 5
100. 1, 11

POST TEST II

Answer Key

Step A

Sets

1. 7
2. 2
3. 3
4. 7
5. 2

Multiplication

6. 81
7. 48
8. 27
9. 54
10. 64
11. 63
12. 24
13. 32
14. 49
15. 40
16. 72
17. 56
18. 36
19. 45
20. 56

Division

21. 9
22. 8
23. 3
24. 9
25. 8
26. 7
27. 3
28. 4
29. 7
30. 8
31. 9
32. 7
33. 4
34. 5
35. 8

Geometry

36. triangle
37. parallelogram
38. square
39. rectangle
40. quadrilateral

Measurement

41. 6:00
42. 10:30
43. 3:00
44. 11:55
45. 10:20

Step B

Sets

46. 4, 35
47. 6, 24
48. 5, 45
49. 3, 64
50. 4, 63

Numeral

51. 3/5
52. 1/8
53. 4/6
54. 2/5
55. 1/6

Order

56. =
57. >
58. <
59. =
60. <

Multiplication-Division

Each problem is worth 2 points, 1 point for determining the correct operation and 1 point for finding the correct answer.

61. multiply, 56 popcorn balls
62. multiply, 54 sticks
63. divide, 8 bags
64. divide, 6 trays
65. multiply, 63 stars
66. divide, 9 bunches
67. divide, 9 walnuts
68. multiply, 45¢
69. divide, 4 pages
70. multiply, 81¢

Step B

Geometry

71. 9
72. 12
73. 16
74. 18
75. 30

Measurement

76. 2 ft.
77. 15 ft.
78. 3 yd.
79. 8 yd.
80. 36 eggs

Step C

Numeral

81. 2
82. 9
83. 9
84. 3
85. 2

Order

86. <
87. >
88. =
89. >
90. <

Multiplication

91. 0, 5, 10, 15, 20, 25, 30
92. 0, 4, 8, 12 16, 20, 24
93. 75, 78
94. 50, 55
95. 42

Step C

Division

96. 1, 8, 2, 4,
97. 1, 9, 3
98. 1, 18, 2, 9, 3, 6
99. 1, 16, 2, 8, 4
100. 1, 7

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I. Concept:

Sets: Solving two-stage problems, involving 2 sets of numbers.

II. Behavioral Objective:

The student given story problems involivng two sets of numbers will be able to set up and solve two-stage problems.

III. Mathematical Ideas:

Note: The five-step method for solving story problems is:

Step 1. Think: What are the numbers of the sets?

Step 2. Think: What is happening to the sets?

Step 3. Write an equation.

Step 4. Solve the equation.

Step 5. Use the solution to answer the question.

IV. Vocabulary To Stress:

sets equation two stages solution

V. Activities:

A. Have children make up two-stage word problems for their classmates.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 263, (67, 76).
Houghton Mifflin (1972) pp. 269, (67).
Addison-Wesley (1971, 1968) pp. 229, 245, 276.

Book: 4

Houghton Mifflin (1967) p. 206
Houghton Mifflin (1972) pp. 88-89, (23)

9-2 Level: 9 Step: A Concept: Sets

WORKSHEET

WRITE AND SOLVE AN EQUATION FOR EACH PROBLEM.

1. Three rows of 11 cookies and 4 rows of 7 cookies are how many cookies in all?

   ____

2. Shining shoes, Sam made 80¢ a week for 3 weeks. During the next 5 weeks he made 75¢ a week. How much money did he earn in all?

   ____

3. Kay rode her bike 30 miles each week for 4 weeks. Then she rode her bike 35 miles a week for 6 weeks. How many miles did she ride in all?

   ____

4. John has 7 packs of gum with 8 sticks in each pack and 4 packs of gum with 5 sticks in each pack. How many sticks of gum does John have in all?

   ____

5. Six cars each have 6 children in them and 4 cars each have 5 children in them. How many children were in the cars?

   ____

6. Jane has 6 bags of candy with 8 pieces in each bag and 7 bags of candy with 9 pieces in each bag. How many pieces of candy does she have in all?

   ____

7. Bill bought 7 bags of marbles with 12 marbles in each bag and 6 bags of marbles with 10 marbles in each bag. How many marbles does he have in all?

   ____

8. There are 5 boxes of 15 candy bars and 7 boxes of 14 candy bars. How many candy bars in all?

   ____

9. Three buses each have 48 children on them and 2 buses each have 64 children on them. How many children are there in all?

   ____

10. Ben sold 6 boxes of cookies for 50¢ each and 7 boxes of cookies for 75¢ each. How much did he earn in all?

   ____

I. Concept:

Numeral: Naming even and odd numbers.

II. Behavioral Objective:

The student given any numeral up to seven digits will be able to name those which are even and those which are odd.

III. Mathematical Ideas:

A. An even number is a number which has two as a factor. Zero is an even number because 2 x 0 = 0.

B. An odd number cannot be divided evenly by two.

IV. Vocabulary To Stress: odd even

V. Activities:

A. "Sherlock Holmes Detective Fan Club." The teacher gives the children clues about missing members. For example, "He is even, not yet 10, but older than 6." "This member is an odd number. He is older than 7 but not yet 11."

B. Odds and Evens Game with Dice. This game is best played with two children but can be adapted to teams. One child is Even and the other is Odd. They take turns rolling the dice. If the total is Even, then that child gets a point. If the total is Odd, then that child gets the point.

C. "Finger Game." This game can be played with teams or with two children. One team or child is "Odd" and the other Even." Two children (one from each team) stand back to back and hold up a certain number of fingers. Then they turn around; and if the total number of fingers is an even number, then the Even team gets a point. If the total number of fingers held up is an odd number, then the Odd team gets a point. The team with the most points wins the game.

TEXT REFERENCES:

Book: 3

Houghton Mifflin (1967) pp. 226-227.
Houghton Mifflin (1972) p. 280.
Addison-Wesley (1971, 1968) pp. 198-200.

Book: 4

Addison-Wesley (1971, 1968)
pp. 232-233

Other References:

*Modern Mathematics, Filmstrips 723:23-34, 735:7-21.

* Suggested Introductory Activity

9-4 Level: 9 Step: A Concept: Numeral

WORKSHEET

WRIET EVEN OR ODD.

1. 3 ________
2. 0 ________
3. 16 ________
4. 45 ________
5. 60 ________
6. 356 ________
7. 967 ________
8. 1379________
9. 700 ________
10. 53 ________
11. 4311 ________
12. 654 ________
13. 790 ________
14. 9637 ________
15. 348 ________
16. 4759 ________
17. 5673 ________
18. 7,565,702 ________
19. 9001 ________
20. 1,000,000 ________

21. 17 ________

22. There are two __________numbers less than 3.

23. The sum of two odd numbers is an ________ number.

24. The sum of an odd number and an even number is an ________ number.

25. The sum of two even numbers is an ________ number

26. Name the odd numbers between 10 and 20. ______, ______, ______, ______.

27. Name the even numbers between 25 and 31. ______, ______, ______.

28. The digit in the ones' place for an even number is____, ____, ____, ____, ____.

29. The digit in the ones' place for an odd number is ____, ____, ____, ____, ____.

30. Name the 6 odd numbers just after 44. _____, _____, _____, _____, _____, _____.

31. Name the 6 even numbers just before 157. ____, ____, ____, ____, ____, _____.

Level: 9 Step: A Concept: Multiplication 9-5

I. Concept:

Multiplication: Multiplying with a one-digit factor and a two-digit factor, with or without renaming.

II. Behavioral Objective:

The student given a one-digit factor and a two-digit factor will be able to name the product with or without renaming.

III. Mathematical Ideas:

A. In multiplication the factors are commutative; that is, the order of the factors does not affect the product.

B. Multiplication is the renaming of two factors as a product.

C. Multiplication is repeated addition.

D. Multiplication is the inverse of division.

E. Multiplication is the joining of equivalent sets.

IV. Vocabulary To Stress:

factor product multiplication times (x) equal

V. Activities:

*A. Use a catalog and let children buy several items at the same price, and multiply to get the answer. You can also use newspaper advertisements.

B. The winning Touch (commercial game) Use to review the basic facts.

C. Cross Numbers II (commercial game) Use to review the basic facts.

D. Let's Play Games in Mathematics, Vol. 3, Game #31, 38, 40, 67, 74.

Text References:

Book: 3

Houghton Mifflin (1967)	pp. 210, 212, 259, (1-23), (65), 264, 265, (11-28).
Houghton Mifflin (1972)	pp. 209-213, 218, 219, 258, 262-265, Ex. Prac. 330, 334, 335.
Addison-Wesley (1971, 1968)	pp. 224, 226, 230, 232, (1-42), (44), 260, 270, Supp. Ex., Set 42-44.

Text References: continued

Book: 4

Houghton Mifflin (1967) pp. 117-119, 162.
Houghton Mifflin (1972) pp. 84-86, 90, (48), 190, Extra Practice, 342.
Addison-Wesley (1971, 1968) pp. 170-171.

Book: 5

Houghton Mifflin (1967) p. 105.
Houghton Mifflin (1972) p. 71
Addison-Wesley (1971, 1968) p. 54.

* Suggested Introductory Activity

Level: 9 Step: A Concept: Division 9-7

I. Concept:

Division: Dividing with a two-digit product and one-digit factor with or without remainder.

II. Behavioral Objective:

The student given a one-digit factor and a two-digit product will be able to name the missing factor with or without remainder.

III. Matehmatical Ideas:

A. Division is the inverse of multiplication.

B. Division is the renaming of the product and one factor as a missing factor.

C. Division is separation of a set into equivalent subsets.

D. Division is repeated subtraction.

IV. Vocabulary To Stress:

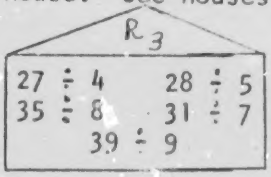
factor
division
equal
remainder
product
divided by (÷) ($)\overline{\quad}$)
quotient

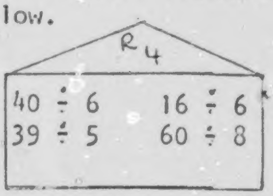
V. Activities:

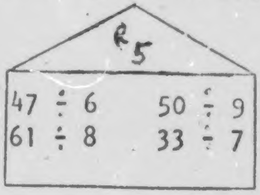
*A Houghton Mifflin (1972) Book 3, p T342-T343.

1) A student having difficulty grasping this concept might be helped by the experience of dealing out cards. Give him 39 cards to deal to 4 students, one at a time, starting with the person to his left and ending each round with himself. In order for each person to have the same number of cards, he must stop dealing when he no longer has enough cards to complete a round. Let him count the cards in each hand plus those left over and record the result as an equation. Help him next to look at a multiplication chart and to figure out how many cards each person would have by finding the largest product less than 39, of which 4 is a factor. You can also have him work the same problem on the number line.

2) You can duplicate sheets with three large houses labeled R_3 R_4 R_5. Underneath list a series of problems many of which when solved will have a remainder of 3, 4, or 5. As the students solve the problems they can put the ones that have a remainder of 3 in the R_3 house and so on. You can then have groups of 3 students compare their papers to see if all have listed the same problems in each house. See houses below.







V. Activities: continued

B. Houghton Mifflin (1972) Book 3, p. T347. You may have the students play a team game using two sets of identical "Product cards." You name a number such as 36 and the factor 5. The first student to name the greatest product less than 36 that has 5 as a factor wins a point (in this example, the first student to hold up "35.")

C. For a review of division basic facts, use the game, Cross Numbers II.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 274-275, (69), 276, (70), 326-329, 332-333, (1-9) 336-337, (79).
Houghton Mifflin (1972) pp. 270-273, (69), 274-276, (70), 281, 283, 307, (78), 310-311, (80) Ex. Prac. 336.

Addison-Wesley (1971, 1968) pp. 272-273, 278-279, 281, (52, 53).

Book: 4

Houghton Mifflin (1967) pp. 108-109, (26), 179, 180-183, 230-231.
Houghton Mifflin (1972) pp. 189, 212-213, 216, 219, 230-231, 236—237.
Addison Wesley (1971, 1968) pp. 200-203.

Book: 5

Houghton Mifflin (1967) pp. 118-120.
Houghton Mifflin (1972) pp. 82-83.

Book: 6

Houghton Mifflin (1967) pp. 56-57.

Other References:

Imperial Tapes (intermediate), Tape 13

* Suggested Introductory Activity

I. Concept:

Functions and Graphs: Naming and applying the rule for ordered pair.

II. Behavioral Objective:

The student given ordered pairs will be able to name the rule and apply it to find the second member in other pairs.

III. Mathematical Ideas:

A. If two objects are paired in a definite order, they are called an ordered pair.

B. A set of ordered pairs, when described by a rule that enables us to find any second number given the first member, is called a function.

IV. Vocabulary To Stress: ordered pair rule number pair

V. Activities:

*A. Write a number of simple sequences on the board and ask the children what the next number in each sequence would be. The children will give the rule for each sequence.

2, 4, 6, 8, 10, 12, . . .

Rule: Add 2 to the previous number.

5, 10, 15, 20, . . .

Rule: Add 5 to the previous number.

*B. Addison-Wesley Book 3, p. 38. Play "What's My Rule." Ask the children to give you a number less than 10. Give them a number, according to your rule. If "Add 3" is your rule, your answer to "6" would be "9." When a child thinks he knows your rule, he should fold his arms and not tell anyone. When you call on a person with his arms crossed, he should ask you for a number less than 10 and respond with a number according to your rule. Continue the game until nearly all students have their arms crossed, signifying that they know your rule.

C. Addison-Wesley Book 3, p. 39. Play Three-Team Relay." Organize the class into three evenly-matched teams. Ask them to line up facing the chalkboard and give each team leader a different color of chalk. Uncover addition tables that you have previously put on the chalkboard. Use the same table in three locations. Instruct the leaders to race to the board, write in the first answer, return the chalk to the next teammate, and kneel at the end of the line. Award two points to the first team kneeling down and one point for each correct answer. Use tables such as the following. (Can be any operation). See examples on following page.

V. Activities: continued

C. Continued:

ADD 7	
3	
9	
7	
8	
6	
5	

SUBTRACT 6	
12	
15	
10	
14	
6	
9	

MULTIPLY 4	
4	
7	
9	
8	
6	
5	

DIVIDE 7	
56	
14	
28	
49	
35	
21	

Text References:

Book: 3

Houghton Mifflin (1967)	pp. 39, (11), 78, 95, 97, 99, 146, 186, 208, 300.
Houghton Mifflin (1972)	pp. 37, (10), 45, 51, 53, 79, (21), 140, 208, 233. Ex. Prac. 322, 326, 329.
Addison-Wesley (1971, 1968)	pp. 39-41, 153, 258-259.

Book: 4

Houghton Mifflin (1967)	pp. 41, 112.
Houghton Mifflin (1972)	pp. 34, 35, 40-41, 78.
Addison-Wesley (1971, 1968)	pp. 28, 29.

Book: 6

Houghton Mifflin (1972)	pp. 38, 44, (1-4), 338, (1-9).

* Suggested Introductory Activity

WORKSHEET

FIND THE RULE AND FILL THE BLANK.

RULE

1. __________ (5,10), (3,6), (8,___), (1,___), (4,___)
2. __________ (6,3), (8,4), (12,___), (4,___), (10,___)
3. __________ (3,15), (6,30), (4,____), (7,___), (2,___)
4. __________ (4,10), (1,7), (2,___), (6,___), (7,___)
5. __________ (2,4), (6,12), (9,___), (7,___), (2,___)
6. __________ (10,5), (5,0), (9,___), (12,___), (11,___)
7. __________ (1,2), (4,8), (7,___), (5,___), (9,___)
8. __________ (18,6), (12,4), (9,___), (6,___), (21,___)
9. __________ (2,10), (7,35), (5,___), (3,___), (6,___)
10. __________ (7,4), (11,8), (5,___), (8,___), (3,___)
11. __________ (25,5), (30,6), (20,___), (35,___), (45,___)
12. __________ (4,11), (1,8), (2,___), (7,___), (5,___)
13. __________ (3,9), (2,6), (4,___), (6,___), (5,___)
14. __________ (56,7), (64,8), (48,___), (24,___), (32,___)
15. __________ (9,81), (2,18), (3,___), (5,___), (7,___)

I. Concept:

Geometry: Naming the diameter and radius of a circle.

II. Behavioral Objective:

The student given a circle will be able to name the radius, diameter, and center.

III. Mathematical Ideas:

A. A circle is a special kind of simple closed curve. Every point on the curve is the same distance from the center.

B. The radius of a circle is a line segment with one endpoint on the circle and the other endpoint in the center of the circle.

C. The diameter of a circle is a line segment which has both endpoints on the circle and passes through the center of the circle.

D. The length of a diameter of a circle is twice the length of the radius.

IV. Vocabulary To Stress:

diameter
radius
center
line segment
circle
simple closed curve

V. Activities:

*A. Houghton Mifflin Geocard 20.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 84-85, (23), 284-285, (72).
Houghton Mifflin (1972) pp. 110-111, (28).
Addison-Wesley (1971, 1968) pp. 192-193.

Book: 4

Houghton Mifflin (1967) pp. 78-79.
Addison-Wesley (1971, 1968) pp. 66-71

Other References:

Franklin Series, Paper and Pencil Geometry: Circle, 5, 8-9, 11-14, 28-29, 52-56, 62, 74, 89. 93, 98.
*Modern Mathematics, Filmstrip 770:1-7
*Forms We See Series, Filmstrip and Tape, Circle

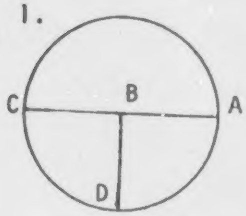
* Suggested Introductory Activity

Level: 9 Step: A Concept: Geometry 9-13

WORKSHEET

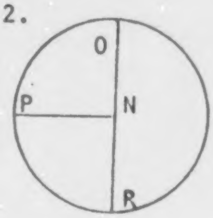
NAME THE PARTS OF THE CIRCLES.

1.



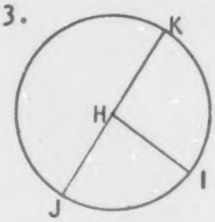
radius ______
center ______
diameter ____

2.



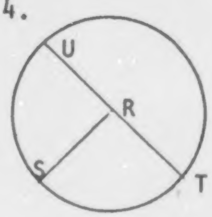
radius ______
center ______
diameter ____

3.



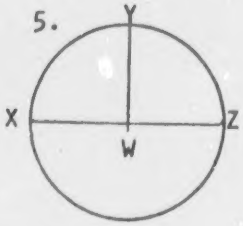
radius ______
center ______
diameter ____

4.



radius ______
center ______
diameter ____

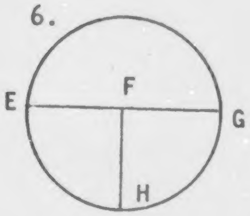
5.



radius ______
center ______
diameter ____

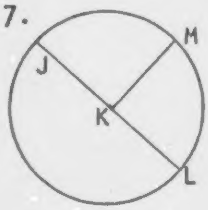
WRITE RADIUS, DIAMETER, OR CENTER IN EACH BLANK.

6.



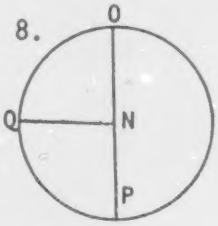
$\overline{FH}$ ____________
$\overline{EG}$ ____________
F ____________

7.



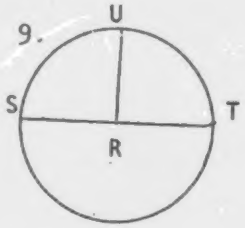
$\overline{JL}$ ____________
$\overline{KL}$ ____________
$\overline{KM}$ ____________

8.



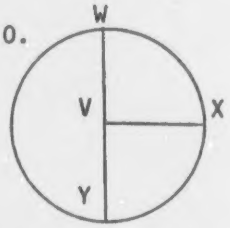
N ____________
$\overline{OP}$ ____________
$\overline{NQ}$ ____________

9.



$\overline{ST}$ ____________
R ____________
$\overline{RU}$ ____________

10.



$\overline{VX}$ ____________
$\overline{WY}$ ____________
V ____________

11. The ________________ is twice the radius.

12. The length of a radius is one half of the length of a ______________.

13. A ____________ has one endpoint on the circle and the other at the center of the circle.

14. A ____________ passes through the center of the circle.

9-14 Level: 9 Step: A Concept: Measurement

I. Concept:

Measurement: Solving problems involving time.

II. Behavioral Objective:

The student given verbal problems involving time will be able to solve them.

III. Mathematical Ideas:

A. The face of a clock can be thought of as a number line from 0 to 60. Because of the way it is marked off at five minute intervals, it can also be thought of as a number line from 1 to 12.

B. There are 60 seconds in a minute.

C. There are 60 minutes in an hour.

D. There are 24 hours in a day.

E. There are 7 days in a week.

F. There are about 4 weeks in a month.

G. There are 12 months in a year.

H. There are about 365 days in a year.

I. A.M. is the abbreviation for ante meridiem, meaning being before noon.

J. P.M. is the abbreviation for post meridiem, meaning after noon.

IV. Vocabulary To Stress:

minute
hour
second
half past
quarter past
quarter to
hour
week
day
month
year

Text References:

Book: 3

Houghton Mifflin (1967) p. 153.
Houghton Mifflin (1972) p. 153.
Addison-Wesley (1971, 1968) pp. 226, 277.

Other References:

Franklin Series, Learning About Measurement, pp. 74-84

Modern Mathematics, Filmstrip 709, Time.

WORKSHEET

1. What time is it 2 hours after 1 o'clock? ______________________
2. What time is it 5 hours after 3 o'clock? ______________________
3. What time is it 7 hours after 9 o'clock? ______________________
4. What time is it 6 hours after 7 o'clock? ______________________
5. What time is it 2 hours before 12 o'clock? ______________________
6. What time is it 4 hours before 6 o'clock? ______________________
7. What time is it 6 hours before 2 o'clock? ______________________
8. What time is it 3 hours before 9 o'clock? ______________________
9. What time is it 3 hours before 1 o'clock? ______________________
10. What time is it 8 hours before 2 o'clock? ______________________
11. Jane's favorite TV show begins at half past four and ends at five o'clock. How long does the show last?

    ____
12. John started playing ball at quarter to two. He played ball for forty-five minutes. What time was it when John stopped playing ball?

    ____
13. Tom read a book from quarter to five until twenty-five past six. How long did Tom read the book?

    ____
14. The baseball game lasted two hours and forty minutes. It started at 1 o'clock. What time was it over?

    ____
15. The program lasted one hour and fifteen minutes. It was over at eight thirty. What time did the program start?

    ____

9-16 Level: 9 Step: B Concept: Sets

I. Concept:

Sets: Using the grouping (associative) principle in multiplication.

II. Behavioral Objective:

The student given multiplication problems will be able to solve equations which require the use of the grouping principle.

III. Mathematical Ideas:

A. Multiplication is associative. This means that the way factors are grouped for multiplication does not affect the product.

IV. Vocabulary To Stress

factor
product
associative
principle
grouping

Text References:

Book: 3

Houghton Mifflin (1967) pp. 254-255, (63), 314-315.
Houghton Mifflin (1972) pp. 256-257, (64).
Addison-Wesley (1971, 1968) pp. 100-101.

Book: 4

Houghton Mifflin (1967) pp. 115-116.
Houghton Mifflin (1972) pp. 82-83.
Addison—Wesley (1971, 1968) p. 136.

Level: 9 Step: B Concept: Sets 9-17

WORKSHEET

1. (1 x 2) x 3 =
_____ x 3 = ☐

2. (2 x 2) x 4 =
_____ x 4 = ☐

3. (3 x 2) x 2 =
_____ x 2 = ☐

4. (2 x 3) x 3=
_____ x 3 = ☐

5. (4 x 2) x 1 =
_____ x 1 = ☐

6. (2 x 4) x 2 =
_____ x 2 = ☐

7. 1 x (2 x 3) =
1 x _____ = ☐

8. 2 x (2 x 4) =
2 x _____ = ☐

9. 3 x (2 x 2) =
3 x _____ = ☐

10. 2 x (3 x 3) =
2 x _____ = ☐

11. 4 x (2 x 1) =
4 x _____ = ☐

12. 2 x (4 x 2) =
2 x _____ = ☐

9-18 Level: 9 Step: B Concept: Numeral

I. Concept:

Numeral: Naming value of Roman Numerals: I to L (1 to 50).

II. Behavioral Objective:

The student given Roman Numerals with values from 1 to 50 will be able to name their value.

III. Mathematical Ideas:

A. Roman system vs. Hindu-Arabic system.

1. Similarities:
   a. Both use addition.
   b. Both use grouping.

2. Differences:
   a. Roman system has 2 bases, (5 and 10); Hindu-Arabic has 1 (base 10).
   b. Roman system is not a place value system. It is not used for computation.

B. Numbers to the left are subtracted if the number to its right has greater value. Numbers to the right are added if the number to its left has greater value.

IV. Vocabulary To Stress:

base place-value Roman system Hindu-Arabic system

V. Activities:

A. Count by 10's to 50: X, XX, XXX, XL, L.

B. Count by 5's to 50.

C. Complete the following tables:

+	1	2	3	4	5	6	7
1	II	III					
2	III						
3	IV						
4							
5							
6							
7							

X	1	2	3	4	5	6	7	8	9	10
1	I	II	III							
2	II	IV	VI							
3	III	VI	IX							
4										
5										

V. Activities: continued

C. "Roman Detective." Teacher writes on the board Roman Numerals in order from I to L. The children put their heads down. The teacher erases two Roman Numerals. When the children put their heads up, she selects one child to supply the missing numerals. Repeat activity; however, the next time around the child will erase two numerals and select another child to supply the missing numerals.

D. "Count with Roman Numerals." Give the children 10 minutes to see if they can write the Roman Numerals from I to L.

Text References:

Book: 2

Addison-Wesley (1971, 1968) pp. 137-138, (38).

Book: 3

Houghton Mifflin (1967) p. 251.
Houghton Mifflin (1972) p. 252

Book: 4

Houghton Mifflin (1967) p. 22.
Houghton Mifflin (1972) p. 28.

Other References:

Franklin Series, Learning About Measurement, pp. 78-80.

9-20 Level: 9 Step: B Concept: Numeral

WORKSHEET

I. Match:

1. V	50
2. IX	14
3. XXXVII	22
4. XVIII	5
5. X	1
6. XXII	9
7. L	40
8. XL	18
9. I	37
10. XIV	10

II. Write Roman Numerals:

11. 32 ______________________
12. 11 ______________________
13. 26 ______________________
14. 12 ______________________
15. 8 ______________________
16. 19 ______________________
17. 35 ______________________
18. 3 ______________________
19. 45 ______________________
20. 2 ______________________

III. Write Hindu-Arabic Numerals:

21. XXI ______________________
22. IV ______________________
23. XIII ______________________
24. XLIV ______________________
25. XXXI ______________________
26. XX ______________________
27. VI ______________________
28. XLVI ______________________
29. VII ______________________
30. XVII ______________________

I. Concept:

Multiplication and Division: Solving word problems involving multiplication and division.

II. Behavioral Objective:

The student given word problems with a two-digit factor and a one-digit factor or a one-digit factor and a two-digit product will be able to determine the operation and solve the problem.

III. Mathematical Ideas:

A. In multiplication the factors are commutative.

B. Multiplication is the renaming of two factors as a product.

C. Multiplication is repeated addition.

D. Multiplication is the inverse of division.

E. Multiplication is the joining of equivalent sets.

F. Division is the renaming of the product and one factor with a missing factor.

G. Division is separation of a set into equivalent subsets. There may be remainders after the equivalent subsets are named.

H. Division is repeated subtraction.

I. Word problems require finding another name for the cardinal number of the sets in the problem.

J. Mathematical thinking involves identifying the sets and distinguishing between joining and separating the sets.

IV. Vocabulary To Stress:

factor
product
multiplication
times (x)

quotient
remainder
division
equal

divided by (÷) (⟌)

Text References:

Book: 3

Houghton Mifflin (1967) pp. 211, (22-25), 213, (25-26), 216, 248, (25-30), 259, (24-27), 266, (1-4), 277, (76), 324, 334-335, (1-5), 339.
Houghton Mifflin (1972) pp. 216, 263, 267, 276-277, 282, 304, 312-314.
Addison-Wesley (1971, (1968) pp. 214-215, 223, 225, 227, 231, 245, 275, 281, 283, (46), (54).

9-22 Level: 9 Step: B Concept: Multiplication & Division

Text References: continued

Book: 4

Houghton Mifflin (1967) pp. 149, 303

Book: 5

Houghton Mifflin (1967) p. 119, (27-28).
Houghton Mifflin (1972) pp. 71, (21-22), 83, (32-33).

I. Concept:

Functions and Graphs: Reading ordered pairs graphed on a plane.

II. Behavioral Objective:

The student given a graph will be able to name a number pair for a given point.

III. Mathematical Ideas:

A. A point on a plane can be located by a number pair.

B. The numbers of the pair are related to two number lines, drawn at right angles, each of which is called an axis. The horizontal line is called the first axis and the vertical one, the second axis.

C. A graph is a pictorial representation of numerical data.

IV. Vocabulary To Stress:

function ordered pairs point graph

V. Activities:

*A. Have student make their own graphs to show progress in reading, spelling, arithmetic, etc.

*B. "Bureau of Missing Persons." Preparation and materials: Each child will need a 9" x 12" sheet of newsprint, a pencil, and a quantity of buttons, seeds, squares of paper, etc. to use as markers.

Emphasize: In a number pair, one moves first horizontally and then vertically.

The teacher will present a seating chart large enough for the children to read. The children will fold their paper to form the necessary number of squares. Each child will make his own seating chart and move it to the upper left corner of his desk. The teacher will give a clue by writing a number pair on the board such as 3,2. The junior detective will try to find the missing person, and they will make a report by writing the person's name on a sheet of paper. The Bureau Chief (teacher) will go around to each junior detective to see if he has cracked the code and found the missing person. (Jim). Some other number pairs are: 5,3 = Bob; 1,3 = Carol; 3,4 = Ted; 5,1 = Alice.

5	Connie	Bill	Sue	Doug	Jill
4	Alvin	Marie	Ted	Betty	Bret
3	Carol	Kevin	Sandy	Glen	Bob
2	Mike	Sheila	Jim	Barbara	Joe
1	Jane	Martin	Karen	Art	Alice
	1	2	3	4	5

V. Activities: continued

C. Meal-Spiel Drive-in:

MENU SPECIALS FOR TODAY

4	Apples	Oranges	Tomatoes	Bananas
3	French Fries	Hamburgers	Hot Dogs	Pickles
2	Mustard	Malt (any flavor)	Soda (any flavor)	Ketchup
1	Pizza	Gravy	Relish	Mashed Potatoes
	1	2	3	4

Order what you'd like to eat on your order blank. To place an order, write the name of the item first, then write its number pair next to it. (Remember to go across first!) Make sure you don't get a tomato, if you ordered a banana!

The child calls the first item of his order (2, 2). The counterman picks out malt. The child calls his second item (3, 3). The counterman picks out hot dog. The child calls his third item (1, 2). The counterman picks out mustard. The child presents his order blank to the counterman. It is then that the counterman sits and the child who has ordered now becomes the counterman. However, the teacher will select the children who "order." If the counterman makes a mistake, he must sit down immediately and the child picks a new counterman for the interim, until his order is completed.

Naturally, the teacher will adapt these rules as she sees fit.

ANSWER KEY FOR MEAL-SPIEL:

apples: 1,4
oranges: 2,4
tomatoes: 3,4
bananas: 4,4
french fries: 1,3
hamburgers: 2,3
hot dogs: 3,3
pickles: 4,3
mustard: 1,2
soda: 3,2
ketchup: 4,2
pizza: 1,1
gravy: 2,1
relish: 3,1
mashed potatoes: 4,1

ORDER BLANK

Item	Order Pair
(Malt)	(2,2)
(hot dog)	(3.3)
(Mustard)	(1,2)

Text References:

Book: 3

Houghton Mifflin (1967) pp, 298-302, (74), 303-304, (75); 306-307.
Houghton Mifflin (1972) pp. 118-121, 296-297, (74, 75), 316.
Addison-Wesley (1971, 1968) pp. 246-251.

Book: 4

Houghton Mifflin (1967) pp. 84-87, (18); 272-273, (67).
Houghton Mifflin (1972) pp. 118-121.
Addison-Wesley (1971, 1968) pp. 244-249

* Suggested Introductory Activity

9-26 Level: 9 Step: B Concept: Geometry

I. Concept:

Geometry: Recognizing spheres, cylinders, and cubes.

II. Behavioral Objective:

The student given diagrams of various geometric shapes will be able to name those which are spheres, cylinders, and cubes.

III. Mathematical Ideas:

A. A simple closed surface is a three dimensional figure that separates space into three disjoint sets of points, those inside, those outside, and those on the surface.

B. A sphere is a closed surface such that every point on it is the same distance from an interior point called the center.

C. A cylinder is the union of two circular regions of the same radius in parallel planes and a curved surface. The circular regions are called bases.

D. A space figure formed by the union of six square regions called faces is a cube.

E. The space inside a simple closed surface has a property called volume, usually measured by comparison with a unit cube.

IV. Vocabulary To Stress:

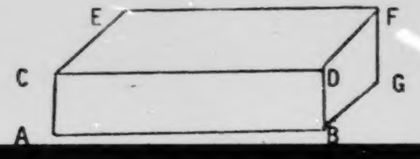
sphere	cylinder	cube	interior
three-dimensional	exterior	closed surface	

V. Activities:

*A. Children can make cylinders from construction paper. (Use for lanterns). For cylinder demonstration tin cans, toy drums, straight candles, and straight sided mugs can be used. Children can make spheres from modeling clay.

B. SUBSETS OF SPACE

How many dimensions?	What is it called?	Can you find it on the drawing?
3	solid	whole object
2	plane	face--CABD
1	line	edge--AB
0	point	"corner point" B



V. Activities

*C. Use Houghton Mifflin Geometric Shapes to demonstrate spheres, cylinders, and cubes.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 292-293, (73)
Houghton Mifflin (1972) pp. 292-293.

Book: 5

Houghton Mifflin p. 85, (23).

Book: 4

Houghton Mifflin (1967) pp. 261, 262 264.

Houghton Mifflin (1972) pp. 293, 296-297.

Other References:

Franklin Series, *Paper and Pencil Geometry*: cube, 5, 8, 10, 37. 85-92, 98; cylinder, 5, 93-96, 98; sphere, 5, 98.

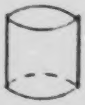
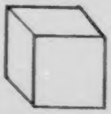
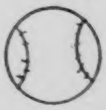
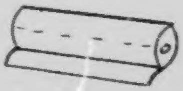
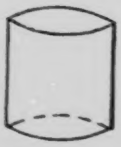
*Modern Mathematics, Filmstrip 716: 29-41

* Suggested Introductory Activity

9-28 Level: 9 Step: B Concept: Geometry

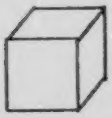
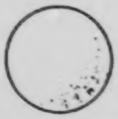
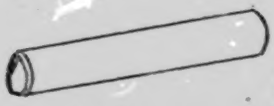
WORKSHEET

WRITE C FOR CUBE, S FOR SPHERE, AND CY FOR CYLINDER.

1. ________ 2. ________ 3. ________ 4. ________ 5. ________

USE THE FIGURES BELOW TO HELP UNSCRAMBLE THE WORDS.

6. UCBE ________ 7. SEPHRE ________ 8. ICNYLDRE ________

9. How many flat surfaces does a cube have? ________

10. How many flat surfaces does a sphere have? ________

11. How many flat surfaces does a cylinder have? ________

NAME THREE EXAMPLES OF EACH.

12. Sphere ____________, ____________, ____________

13. Cube ____________, ____________, ____________

14. Cylinder ____________, ____________, ____________

I. Concept:

Measurement: Making change involving amounts of money up to $10.

II. Behavioral Objective:

The student given the cost of items and amounts of money up to $10 will be able to make change with the fewest coins possible.

III. Mathematical Ideas:

A. The values of dollars, dimes, nickels, and pennies may be expressed in cents.

B. Dollars correspond to hundreds, dimes to tens, and pennies to ones in our numeration system. One hundred cents can be thought of as the value of 1 dollar, 10 dimes, or 100 pennies.

C. In writing the name for an amount of money, we may use the ¢ sign or the $ with the point. The point marks off the dollars and cents.

IV. Vocabulary To Stress:

dollar nickel half dollar quarter penny
dime dollar sign and point ($.) cent sign (¢)

V. Activities:

*A. Playing "Store." Have children bring empty grocery boxes and cans from home. Put prices on them. Make out shopping lists and let children take turns being the grocer. Use play money to make change.

B. Enrichment. Given a budget of $300, the child will figure out how he or she would most like to decorate his or her room. Catalogs, newspaper ads, magazine articles and illustrations or other items can be used. The child can make a notebook, write an essay or otherwise illustrate how this is to be done. Later the budget can be revised either upward or downward (a challenge) and be done completely differently. Other goals for money spending can be set later.

C. Let's Play Games in Mathematics, Volume Three, Game No. 44.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 15-17, (5); 22-23, 246-248, 278-280, (71), 296.
Houghton Mifflin (1972) pp. 9, 17, 19, 70-71, 77, 148, 185, 237-239.
Addison-Wesley (1971, 1968) pp. 76-78, (21, 22); 271, 276, 305, 306.

9-30 Level: 9 Step: B Concept: Measurement

Text References: continued

Book: 4

Houghton Mifflin (1967) pp. 58-61, (13).
Houghton Mifflin (1972) pp. 54-57.

Other References:

Franklin Series, Learning About Measurement; dollars and cents, pp. 94-102.

*Modern Mathematics, Filmstrip 721: 21-38

* Suggested Introductory Activity

WORKSHEET

MAKE CHANGE USING THE FEWEST COINS POSSIBLE. WRITE THE NUMBER OF EACH COIN YOU USE IN THE BOX BELOW THAT COIN.

	COST	AMOUNT GIVEN	PENNY	NICKEL	DIME	QUARTER	HALF DOLLAR	DOLLAR
1.	$ .37	$ .50						
2.	$ .43	$ .50						
3.	$ .19	$ 1.00						
4.	$ .63	$ 1.00						
5.	$ .87	$ 1.00						
6.	$1.13	$ 2.00						
7.	$3.42	$ 5.00						
8.	$4.61	$10.00						
9.	$6.83	$10.00						
10.	$8.72	$10.00						

9-2 Sets

1. (3 x 11) + (4 x 7) = 61 cookies
2. (80 x 3) + (75 x 5) = $6.15
3. (30 x 4) + (35 x 6) = 330 miles
4. (7 x 8) + (4 x 5) = 76 sticks
5. (6 x 6) + (4 x 5) = 56 children
6. (6 x 8) + (7 x 9) = 111 pieces of candy
7. (7 x 12) + (6 x 10) = 144 marbles
8. (5 x 15) + (7 x 14) = 173 candy bars
9. (48 x 3) + (2 x 64) = 272 children
10. (6 x 50) + (7 x 75) = $8.25

9-4 Numerai

1. odd
2. even
3. even
4. odd
5. even
6. even
7. odd
8. odd
9. even
10. odd
11. odd
12. even
13. even
14. odd
15. even
16. odd
17. odd
18. even
19. odd
20. even
21. odd
22. even
23. even
24. odd
25. even
26. 11, 13, 15, 17, 19
27. 26, 28, 30
28. 0, 2, 4, 6, 8
29. 1, 3, 5, 7, 9
30. 45, 47, 49, 51, 53, 55
31. 146, 148, 150, 152, 154, 156

9-11 Functions and Graphs

1. x 2, 16, 2, 8
2. ÷2, 6, 2, 5
3. x5, 20, 35, 10
4. +6, 8, 12, 13
5. x2, 18, 14, 4
6. -5, 4, 7, 6
7. x2, 14, 10, 18
8. ÷3, 3, 2, 7
9. x5, 25, 15, 30
10. -3, 2, 5, 0
11. ÷5, 4, 7, 9
12. +7, 9, 14, 12
13. x3, 12, 18, 15
14. ÷8, 6, 3, 4
15. x9, 27, 45, 63

9-13 Geometry

1. radius $\overline{BC}$, $\overline{BD}$, or $\overline{BA}$
   center B
   diameter $\overline{CA}$

2. radius $\overline{NO}$, $\overline{NP}$, or $\overline{NR}$
   center N
   diameter $\overline{OR}$

3. radius $\overline{HJ}$, $\overline{HK}$, or $\overline{HI}$
   center H
   diameter $\overline{JK}$

4. radius $\overline{RU}$, $\overline{RT}$, or $\overline{RS}$
   center R
   diameter $\overline{UT}$

5. radius $\overline{WX}$, $\overline{WY}$, or $\overline{WZ}$
   center W
   diameter $\overline{XZ}$

6. radius
   diameter
   center

7. diameter
   radius
   radius

8. center
   diameter
   radius

9. diameter
   center
   radius

10. radius
    diameter
    center

11. diameter
12. diameter
13. radius
14. diameter

9-15 Measurement

1. 3:00
2. 8:00
3. 4:00
4. 1:00
5. 10:00
6. 2:00
7. 8:00
8. 6:00
9. 10:00
10. 6:00
11. 30 minutes
12. 2:30
13. 1 hr. 40 min.
14. 3:40
15. 7:15

9-17 Sets

1. 2,6
2. 4,16
3. 6,12
4. 6,18
5. 8,8
6. 8,16
7. 6,6
8. 8,16
9. 4,12
10. 9,18
11. 2,8
12. 8,16

9-20 Numeral

1. 5
2. 9
3. 37
4. 18
5. 10
6. 22
7. 50
8. 40
9. 1
10. 14
11. XXXII
12. XI
13. XXVI
14. XII
15. VIII
16. XIX
17. XXXV
18. III
19. XLV
20. 11
21. 21
22. 4
23. 13
24. 44
25. 31
26. 20
26. 6
28. 46
29. 7
30. 17

9-28 Geometry

1. CY
2. C
3. S
4. CY
5. CY
6. cube
7. sphere
8. cylinder
9. 6
10. none
11. 2

12-14 Answers will vary

9-31 Measurement

	PENNY	NICKEL	DIME	QUARTER	HALF DOLLAR	DOLLAR
1.	3		1			
2.	2	1				
3.	1	1		1	1	
4.	2		1	1		
5.	3		1			
6.	2		1	1	1	
7.	3	1			1	1
8.	4		1	1		5
9.	2	1	1			3
10.	3			1		1

POST TEST I ANSWER KEY

Level: 9

Step A

SETS

1. b
2. b
3. (7 x 8) + (6 x 10) = 116 cards
4. (5 x 3) + (8 x 4) = 47 apples and bananas
5. (3 x 7) + (5 x 6) = 51 pieces of candy

NUMERAL

6. odd
7. even
8. even
9. odd
10. odd

MULTIPLICATION

11. 280
12. 68
13. 402
14. 333
15. 240

DIVISION

16. 11, R3
17. 15, R5
18. 5
19. 45, R1
20. 5

FUNCTIONS & GRAPHS

21. +7, 12, 9, 10, 13
22. ÷4, 4,5,6,9
23. x5, 10,25,35,20
24. -8, 1,4,3,8
25. x3, 6,15,27,18

Step A

GEOMETRY

26. radius $\overline{BA}$, $\overline{BC}$, or $\overline{BD}$
    diameter $\overline{AC}$
    center B
27. radius $\overline{MR}$, $\overline{MK}$, $\overline{ML}$
    diameter $\overline{RL}$
    center M
28. radius $\overline{XS}$, $\overline{XK}$, $\overline{XM}$
    diameter $\overline{SK}$
    center X
29. radius
    center
    diameter
30. center
    diameter
    radius

MEASUREMENT

31. 5:00
32. 3:00
33. 2:00
34. 3:15
35. 1 hr. 15 min.

Step B

SETS

36. 3, 12
37. 15, 30
38. 6,42
39. 3,12
40. 5,30

NUMERAL

41. 4
42. 17
43. 41
44. 26
45. 32

Step B

MULTIPLICATION-DIVISION

Each problem is worth 2 points, 1 point for determining the correct operation and 1 point for finding the correct answer.

46. multiply,
    312 bottle caps
47. multiply,
    282 bottle caps
48. divide,
    16 donuts
49. multiply,
    413 buttons
50. divide,
    24 marbles
51. multiply,
    192 pumpkins
52. divide,
    10 buttons
53. divide,
    9 children
54. multiply,
    70 beads
55. divide,
    18 cookies

FUNCTIONS AND GRAPHS

56. 2,5
57. 4,2
58. 6,1
59. S
60. G

GEOMETRY

61. cube
62. sphere
63. cylinder
64. sphere
65. cylinder

- -

Step B

MEASUREMENT

66. 3 pennies, 1 nickel, 1 dime, 1 quarter
67. 1 nickel, 1 dime, 1 half dollar, 2 dollars
68. 3 pennies, 1 nickel, 1 half dollar, 1 dollar
69. 1 penny, 1 dime, 1 quarter, 5 dollars
70. 2 pennies, 1 dime, 1 quarter, 1 half dollar, 2 dollars

POST TEST II ANSWER KEY

Step A
SETS

1. a
2. a
3. (9 x 8) + (7 x 6) =
   114 horses & monkey books
4. (9 x 6) + (4 x 5) =
   74 pieces of gum
5. (3 x 8) + (4 x 7) =
   52 marbles

NUMERALS

6. odd
7. even
8. even
9. odd
10. odd

MULTIPLICATION

11. 146
12. 260
13. 294
14. 78
15. 256

DIVISION

16. 6R3
17. 19R2
18. 6
19. 43R1
20. 7

FUNCTIONS & GRAPHS

21. +5, 8,9,12,11
22. ÷3, 4,6,5,7
23. x2, 8,10,12,14
24. -7, 1,2,8,7
25. x4, 12,16,24,32

Step A
GEOMETRY

26. radius $\overline{XY}$ $\overline{XZ}$, $\overline{XW}$
    diameter $\overline{WY}$
    center X
27. radius $\overline{MJ}$, $\overline{MK}$, $\overline{ML}$
    diameter $\overline{JL}$
    center M
28. radius $\overline{AB}$, $\overline{AC}$, $\overline{AD}$
    diameter $\overline{BC}$
    center A
29. center
    diameter
    radius
30. diameter
    center
    radius

MEASUREMENT

31. 8:00
32. 4:00
33. 1:45
34. 2:30
35. 1 hr. 15 min.

Step B
SETS

36. 6,12
37. 7,56
38. 8,32
39. 7,35
40. 6,42

NUMERAL

41. 8
42. 43
43. 14
44. 29
45. 35

MULTIPLICATION-DIVISION

Each problem is worth 2 points, 1 point for determining the correct operation and 1 point for finding the correct answer.

46. divide,
    21 boxes
47. multiply,
    395 items
48. multiply,
    608 candy bars
49. divide,
    16 bunches
50. multiply,
    192 red hots
51. divide,
    15 pages
52. divide,
    15 boxes
53. multiply,
    469 cans of dog food
54. divide,
    12 days
55. multiply,
    783 times

FUNCTIONS & GRAPHS

56. 5,5
57. 1,8
58. 8,4
59. D
60. 0

GEOMETRY

61. cube
62. cylinder
63. cube
64. cylinder
65. sphere

- -

Step B
MEASUREMENT

66. 2 pennies, 1 nickel, 1 half dollar
67. 2 dimes, 1 quarter, 1 dollar
68. 4 pennies, 2 dimes, 1 half dollar, 2 dollars
69. 3 pennies, 1 quarter, 5 dollars
70. 3 pennies, 1 quarter, 1 half dollar, 1 dollar

TABLE OF CONTENTS

Level 10

Step A

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2. Numeral: Equivalent fractions using identity element 1 10-4
3. Addition: Fractions with like denominators 10-7
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5. Multiplication: 3 & 4 digit factor by 1 digit factor 10-14
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I. Concept:

Sets: Renaming fractions, whose numerator and denominator are equal, as 1.

II. Behavioral Objective:

The student given a region with equivalent parts or a number sentence will be able to name the sum of two fractions as 1.

III. Mathematical Ideas:

A. The number one is equal to the fractional number obtained when a set is compared to itself.

B. A fractional number line is a line with the points named as fractional numbers.

IV. Vocabulary To Stress: whole set subset fraction

V. Activities:

*A. Use congruent regions to show two halves equal one, 3 thirds equal one, etc. Have the students construct congruent regions showing the above.

*B. Use the number line to show fractional names for 1.

*C. Use the number line paper. Have the children divide it into equivalent regions.

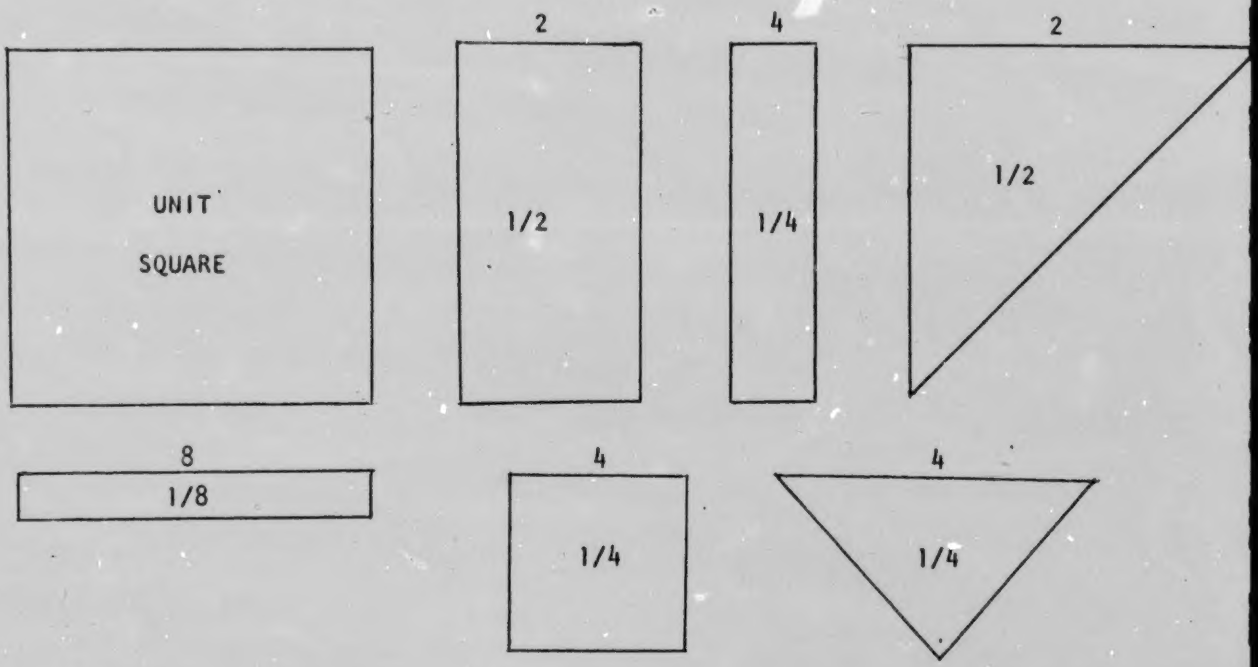
*D. Use the fraction circles; match parts with a whole.

*E. Prepare a set of fraction cards with pairs that total 1, such as $\boxed{6/7}$ $\boxed{1/7}$. Separate these cards into 2 piles so that one of each pair is in each pile. Divide the students into 2 groups giving each group 1 pile of cards to distribute among themselves. When you give the signal, students have to look among the other group to find a mate whose fractional number added to his will add up to 1.

*F. These units could be put on a ditto and the children could trace the unit square on one color of construction paper. They could cut out the fractional parts in another color and glue them on to show how many ways they can form one whole.

V. Activities: continued

Use construction paper. Make 1 large unit square. Using same size square make parts as listed. Make as many parts as numeral at the top indicates.



Text References:

Book: 4

Houghton Mifflin (1967) pp. 135-136, (33), 137, (34).
Houghton Mifflin (1972) pp. 134, 135, (33).

Book: 5

Houghton Mifflin (1967) p. 196.
Houghton Mifflin (1972) pp. 125-129, (35)

* Suggested Introductory Activity

WORKSHEET

SOLVE THE EQUATIONS:

1. $\frac{1}{5} + \frac{4}{5} = \frac{\_}{5} = \underline{\quad 1 \quad}$

2. $\frac{1}{7} + \frac{6}{7} = \frac{\_}{7} = \underline{\qquad}$

3. $\frac{2}{4} + \frac{2}{4} = \frac{\_}{4} = \underline{\qquad}$

4. $\frac{4}{6} + \frac{2}{6} = \frac{\_}{6} = \underline{\qquad}$

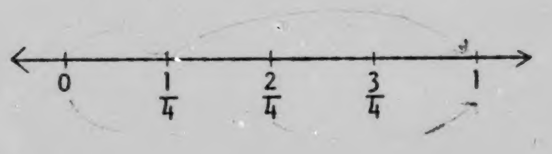
5. $\frac{2}{7} + \frac{\_}{7} = \frac{7}{7} = \underline{\qquad}$

6. $\frac{3}{8} + \frac{\_}{8} = \frac{8}{8} = \underline{\qquad}$

7. $\frac{1}{2} + \frac{\_}{2} = \frac{2}{2} = \underline{\qquad}$

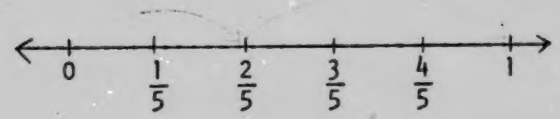
8. $\frac{6}{10} + \frac{\_}{10} = \frac{10}{10} = \underline{\qquad}$

9.



$\frac{1}{4} + \frac{3}{4} = \underline{\qquad}$ $\frac{2}{4} + \frac{\_}{4} = \underline{\qquad}$

10.



$\frac{2}{5} + \frac{3}{5} = \frac{\_}{5} = 1$

DRAW A FRACTIONAL NUMBER LINE TO SHOW THE FOLLOWING EQUATIONS:

11. $\frac{2}{6} + \frac{4}{6} = \frac{6}{6} = 1$

12. $\frac{1}{8} + \frac{7}{8} = \frac{8}{8} = 1$

10-4 Level: 10 Step: A Concept: Numeral

I. Concept:

Numeral: Renaming fractional numbers using identity element 1.

II. Behavioral Objective:

The student given a fractional number in a sentence will be able to rename that fractional number using identity element 1.

III. Mathematical Ideas:

A. Fractional numbers may have many names.

B. Congruent regions are regions of the same size and shape.

C. A fractional number may be used to compare one or more congruent subregions with the total region.

D. Equivalent fractions are fractions naming the same fractional number.

E. A fraction can be renamed as an equivalent fraction by multiplying the numerator and denominator by the same number (identity element 1).

F. A fraction can be renamed as an equivalent fraction by dividing the numerator and denominator by the same number (identity element 1).

IV. Vocabulary To Stress: equivalent fractions congruent regions

V. Activities:

*A. Use sets of objects, congruent regions, attribute blocks, cuisenaire rods, or a number line to show equivalent fractions.

B. Draw number line on the floor marked with the fractions 1/4, 1/2, etc. In a box have cards marked with fractions equivalent to the ones on the number line. Each student can draw a card and then find his place on the number line. If someone is already there, he can stand behind him. Other students should watch to see that each student finds the right spot.

C. Fraction Match-Ups. Preparation--Cut rectangles 3" x 6" from construction paper. Divide the rectangles in half. On each half write a fraction. The fractions on the two halves of a single rectangle will not be equivalent. $\boxed{3/4 \mid 5/10}$.
How to play--An even number of players can play (4 to 6). Place all the cards face down in the center of the table. Each of the players draws 4 cards. The first player may place any one of his cards in the center and the other players, taking turns, may match with an equivalent fraction. $\boxed{1/2 \mid 6/8 \mid 3/4 \mid 6/12}$. If a player is not able to play, he draws another card from the center stock. Play goes to the next player. The first player to use all of his cards is the winner.

V. Activities: continued

D. Take a recipe and have the children change the fractional parts to an equivalent fraction. Bring a measuring cup to demonstrate equivalent fractions. For example, 2/4 = 1/2. Make up recipes using fractions not shown on the cup, such as 6/8 cup flour or 3/6 cup milk.

E. Let's Play Games in Mathematics: Book 4, Game Numbers 48, 75.

Text References:

Book: 4

Houghton Mifflin (1967) pp.	138-140, (35), 141, (36), 142-143, (37), 144-146, (38), 304-306.
Houghton Mifflin (1972) pp.	136-141, (34), 270-272, (67).
Addison-Wesley (1971, 1968)	pp. 261-267, 275, 281-285, 292-301, 305.

Book: 5

Houghton Mifflin (1967) pp.	208-209, (52, 53), 210-213, 218-232.
Addison-Wesley (1971, 1968)	pp. 184-201, 204-211, 224-225.

Book: 6

Houghton Mifflin (1967) pp.	203, 205 #1-12, 206.
Addison-Wesley (1971, 1968)	pp. 126-130, 327 Set 20, 328 Set 21, 22.

Other References:

Imperial Tapes (Intermediate), Lesson 19.

*Modern Mathematics Film Strip 732, 748: 17-36, 762: 18-21, 763: 25-30.

Franklin Math Series, Lyons Carnahan, Patterns and Puzzles in Mathematics, pp. 64-67.

* Suggested Introductory Activity

10-6 Level: 10 Step: A Concept: Numeral

WORKSHEET

EXPRESS THESE FRACTIONS AS SIMPLER EQUIVALENT FRACTIONS.

1. $\frac{4}{14}$ = ________
2. $\frac{12}{15}$ = ________
3. $\frac{6}{24}$ = ________
4. $\frac{9}{12}$ = ________
5. $\frac{18}{20}$ = ________
6. $\frac{15}{18}$ = ________
7. $\frac{8}{10}$ = ________
8. $\frac{6}{12}$ = ________
9. $\frac{5}{20}$ = ________
10. $\frac{7}{14}$ = ________
11. $\frac{10}{12}$ = ________
12. $\frac{2}{6}$ = ________
13. $\frac{12}{20}$ = ________
14. $\frac{10}{30}$ = ________
15. $\frac{5}{15}$ = ________
16. $\frac{10}{14}$ = ________
17. $\frac{8}{14}$ = ________
18. $\frac{10}{15}$ = ________
19. $\frac{9}{18}$ = ________
20. $\frac{9}{24}$ = ________
21. $\frac{10}{20}$ = ________
22. $\frac{20}{25}$ = ________
23. $\frac{6}{8}$ = ________
24. $\frac{12}{16}$ = ________
25. $\frac{30}{40}$ = ________
26. $\frac{10}{16}$ = ________
27. $\frac{8}{12}$ = ________
28. $\frac{4}{8}$ = ________
29. $\frac{20}{24}$ = ________
30. $\frac{3}{6}$ = ________

I. Concept:

Addition: Adding fractions with like denominators whose sum would be less than or equal to 1.

II. Behavioral Objective:

The student given two fractional addends with like denominators will be able to name the sum and express it in simplest form using identity element 1.

III. Mathematical Ideas:

A. A fraction is a numeral which names a fractional number.

B. A fraction may be used to compare a subset with a set.

C. Two subsets of the same set may be joined making a new subset that can be compared with the original set. The fractional numbers for the subsets may be added to give the fractional number for the new subset.

D. Multiplication is distributive over addition. This means that the product of a factor and a sum can be expressed as a sum of 2 products. For example:

$$(2 \times \frac{1}{7}) + (4 \times \frac{1}{7}) = 6 \times \frac{1}{7} \qquad \frac{1}{7}(2 + 4) = (\frac{1}{7} \times 2) + (\frac{1}{7} \times 4)$$

E. A fraction can be renamed as a simpler equivalent form by dividing the numerator and denominator by the same number.

IV. Vocabulary To Stress: numerator denominator fraction subset

V. Activities:

*A. The teacher can use egg cartons to demonstrate addition of fractional numbers.

B. See Level 10A, Subtraction "Try and Guess" - could be adapted for addition.

C. Let's Play Games in Mathematics: Volume Three, Game Number 46.

Text References

Book: 3

Houghton Mifflin (1967) pp. 172-173.
Houghton Mifflin (1972) pp. 176-177, (44).

Text References: continued

Book: 4

Houghton Mifflin (1967) pp. 134-137, (33, 34), 288-289, (70), 292-294 (included subtraction).
Houghton Mifflin (1972) pp. 133-134, (33), 254, 256, 258, 280 (+ & -).
Addison-Wesley (1971, 1968) p. 308.

Book: 5

Houghton Mifflin (1967) pp. 228-230 (includes subtraction), (57).
Houghton Mifflin (1972) pp. 190-191.

Book: 6

Houghton Mifflin (1967) pp. 208-209 (+ & -).
Houghton Mifflin (1972) pp. 139, 190-191 (+ & -).
Addison-Wesley (1971, 1968) pp. 138-139 (+ & -).

Other References:

*Modern Mathematics, Film Strips 758: 1-14, 762: 22-25.

* Suggested Introductory Activity

Level: 10 Step: A Concept: Addition 10-9

WORKSHEET

SOLVE THE EQUATIONS. CHANGE THE ANSWER TO SIMPLEST EQUIVALENT FORM WHEN POSSIBLE.

a. $\frac{1}{5} + \frac{3}{5} =$ ______ or ______

b. $\frac{2}{6} + \frac{1}{6} =$ ______ or ______

c. $\frac{3}{8} + \frac{3}{8} =$ ______ or ______

d. $\frac{2}{9} + \frac{1}{9} =$ ______ or ______

e. $\frac{3}{12} + \frac{1}{12} =$ ______ or ______

f. $\frac{8}{15} + \frac{2}{15} =$ ______ or ______

g. $\frac{3}{10} + \frac{2}{10} =$ ______ or ______

h. $\frac{5}{8} + \frac{2}{8} =$ ______ or ______

i. $\frac{5}{16} + \frac{3}{16} =$ ______ or ______

j. $\frac{1}{8} + \frac{3}{8} =$ ______ or ______

k. $\frac{5}{12} + \frac{4}{12} =$ ______ or ______

l. $\frac{3}{14} + \frac{7}{14} =$ ______ or ______

m. $\frac{2}{15} + \frac{1}{15} =$ ______ or ______

n. $\frac{4}{9} + \frac{1}{9} =$ ______ or ______

o. $\frac{7}{10} + \frac{1}{10} =$ ______ or ______

p. $\frac{1}{4} + \frac{1}{4} =$ ______ or ______

q. $\frac{3}{9} + \frac{3}{9} =$ ______ or ______

r. $\frac{2}{10} + \frac{4}{10} =$ ______ or ______

s. $\frac{1}{16} + \frac{3}{16} =$ ______ or ______

t. $\frac{5}{20} + \frac{7}{20} =$ ______ or ______

u. $\frac{5}{24} + \frac{7}{24} =$ ______ or ______

v. $\frac{2}{15} + \frac{3}{15} =$ ______ or ______

w. $\frac{1}{10} + \frac{3}{10} =$ ______ or ______

x. $\frac{5}{16} + \frac{7}{16} =$ ______ or ______

I. Concept

Subtraction: Subtracting fractions with like denominators.

II. Behavioral Objective:

The student given a fractional sum less than 1 and a lesser fractional addend with like denominator will be able to name the difference and express it in simplest form.

III. Mathematical Ideas:

A. A fraction is a name for a fractional number.

B. A fractional number is used to compare a subset with a set.

C. Subtraction is the process of renaming a sum and an addend as a missing addend or the difference.

D. Subtraction of fractional numbers with like denominators is performed by subtracting the numerators and keeping the same denominator.

E. Multiplication is distributive over subtraction. This means the product of a factor and a missing addend can be expressed as the difference of 2 products.

$$\frac{1}{7}(4-2) = (\frac{1}{7} \times 4) - (\frac{1}{7} \times 2)$$

F. A fraction can be renamed as a simpler equivalent fraction by dividing the numerator and denominator by the same number (identity element 1).

IV. Vocabulary To Stress:

numerator
denominator
subtraction
addend
fractional sum
fractional addend
fraction

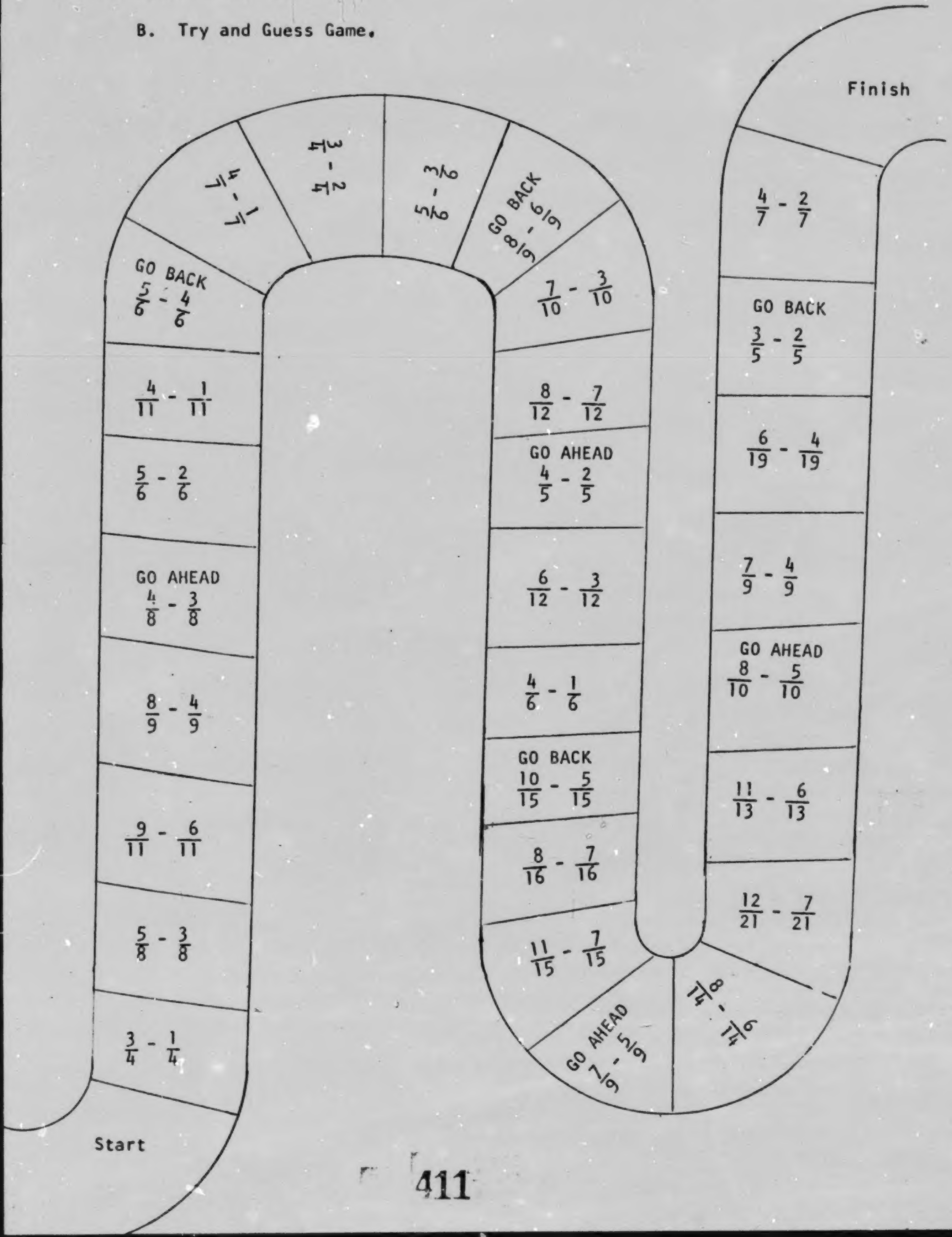
V. Activities:

*A. Use any concrete materials to show subtraction: fraction discs, congruent regions, sets and subsets, number line, attribute blocks.

B. Try and Guess Game. Arithmetic Teacher, February 1970, p. 115. Get to the finish line by spinning or throwing a die to indicate number of boxes to move. Correct answer allows players to remain there until next turn. Wrong answer makes player to back to his preceding position. If player lands on "Go Back," he must go back the number of places indicated in the box. If he lands on "Go Ahead," he will move forward that many spaces. When using fractions, use the numerator of the answer to determine number of spaces to go back or forward. Answers may be on an answer sheet or on the back of the problem.

V. Activities: continued

B. Try and Guess Game.


Start
3/4 - 1/4
5/8 - 3/8
9/11 - 6/11
8/9 - 4/9
GO AHEAD 4/8 - 3/8
5/6 - 2/6
4/11 - 1/11
GO BACK 5/6 - 4/6
4/7 - 1/7
3/4 - 2/4
5/9 - 3/9
GO BACK 8/9 - 6/9
7/10 - 3/10
8/12 - 7/12
GO AHEAD 4/5 - 2/5
6/12 - 3/12
4/6 - 1/6
GO BACK 10/15 - 5/15
8/16 - 7/16
11/15 - 7/15
GO AHEAD 7/9 - 5/9
8/14 - 6/14
12/21 - 7/21
11/13 - 6/13
GO AHEAD 8/10 - 5/10
7/9 - 4/9
6/19 - 4/19
GO BACK 3/5 - 2/5
4/7 - 2/7
Finish

10-12 Level: 10 Step: A Concept: Subtraction

Text References:

Book: 4

Houghton Mifflin (1967) pp. 291-294, (71), 294 (+ & -), 315.
Houghton Mifflin (1972) pp. 255, 257, (63), 259 (+ & -), (64), 280 (+ & -).

Book: 5

Houghton Mifflin (1967) pp. 228-230, (57).
Houghton Mifflin (1972) pp. 190-191.
Addison-Wesley (1971, 1968) pp. 226-227, 336.

Book: 6

Houghton Mifflin (1967) pp. 208-209.
Houghton Mifflin (1972) pp. 90-91.
Addison-Wesley (1971, 1968) pp. 138-139 (+ & -)

Other References:

*Modern Mathematics Filmstrip 758: 15-17

Level: 10 **Step:** A **Concept:** Subtraction 10-13

WORKSHEET

SOLVE THE EQUATIONS. CHANGE THE ANSWER TO SIMPLER EQUIVALENT FORM WHEN POSSIBLE.

a. $\frac{7}{8} - \frac{1}{8} =$ ______ or ______

b. $\frac{5}{6} - \frac{2}{6} =$ ______ or ______

c. $\frac{5}{12} - \frac{2}{12} =$ ______ or ______

d. $\frac{7}{8} - \frac{2}{8} =$ ______ or ______

e. $\frac{9}{10} - \frac{7}{10} =$ ______ or ______

f. $\frac{10}{14} - \frac{7}{14} =$ ______ or ______

g. $\frac{6}{8} - \frac{2}{8} =$ ______ or ______

h. $\frac{5}{9} - \frac{2}{9} =$ ______ or ______

i. $\frac{12}{15} - \frac{7}{15} =$ ______ or ______

j. $\frac{8}{10} - \frac{3}{10} =$ ______ or ______

k. $\frac{11}{12} - \frac{7}{12} =$ ______ or ______

l. $\frac{8}{9} - \frac{1}{9} =$ ______ or ______

m. $\frac{15}{16} - \frac{7}{16} =$ ______ or ______

n. $\frac{9}{12} - \frac{1}{12} =$ ______ or ______

o. $\frac{6}{6} - \frac{2}{6} =$ ______ or ______

p. $\frac{10}{15} - \frac{7}{15} =$ ______ or ______

q. $\frac{17}{20} - \frac{7}{20} =$ ______ or ______

r. $\frac{13}{18} - \frac{4}{18} =$ ______ or ______

s. $\frac{20}{24} - \frac{8}{24} =$ ______ or ______

t. $\frac{20}{30} - \frac{5}{30} =$ ______ or ______

u. $\frac{11}{14} - \frac{7}{14} =$ ______ or ______

v. $\frac{8}{12} - \frac{1}{12} =$ ______ or ______

w. $\frac{13}{15} - \frac{3}{15} =$ ______ or ______

x. $\frac{11}{16} - \frac{3}{16} =$ ______ or ______

I. Concept:

Multiplication: Multiplying with a three or four-digit factor and a one digit factor.

II. Behavioral Objective:

The student given a three or four-digit factor and a one digit factor will be able to name the product.

III. Mathematical Ideas:

A. Multiplication is distributive over addition. In the multiplication 3 x 456 the 3 is a common factor and the total product involves the products 3 x 400, 3 x 50 and 3 x 6.

B. Multiplication is the renaming of two factors as a product.

IV. Vocabulary To Stress: factor product

V. Activities:

A. A baseball or football game could be used for added interest.

*B. A number wheel can be used. Expanded numerals can be reviewed with a place value chart.

C. Use a circular shape the size of a pizza board. Clip different factors to the outer edge with clothespins or paper clips. Put one factor in the center on a sheet of construction paper so it can be removed. Use masking tape to secure it to the board. The answers are written on the backs of the cards. You can change the factors. The child can do this in his spare time.

Test References:

Book: 3

Houghton Mifflin (1967) pp. 256-258, (66), 260-261, 322-323.
Houghton Mifflin (1972) pp. 259-261, 266, 302-303, Extra Practice, 335.
Addison-Wesley (1971, 1968) pp. 234, 236, Supp. Ex. 45, 46.

Book: 4

Houghton Mifflin (1967) pp. 120-121, 124, 163-164, 166, 224, 225, 226 (parts).
Houghton Mifflin (1972) pp. 191-194, (48), 196, 222-224, 348 #8-10.
Addison-Wesley (1971, 1968) pp. 140-141, 172, 173, (32, 34), Supp. Ex. 30.

Book: 5

Houghton Mifflin (1967) pp. 106, 107, 108 (30).
Houghton Mifflin (1972) pp. 72, 73.

Book: 6

Houghton Mifflin (1972) pp. 62 #1-20.
Addison Wesley (1971, 1968) pp. 46 & 47, #1-4

* Suggested Introductory Activity

I. Concept:

Division: Dividing 3 or 4-digit products by a 1-digit factor with or without a remainder.

II. Behavioral Objective:

The student given a 3 or 4-digit product and a 1-digit factor will be able to name the quotient with or without a remainder.

III. Mathematical Ideas:

A. Multiplication and division are opposite operations.

B. Division is naming the missing factor when the product and one of the factors are given.

C. Once concept is understood, student should be able to use x number of digits as dividend.

IV. Vocabulary To Stress:

quotient
dividend
remainder
factor
product
divisor

Text References:

Book: 3

Houghton Mifflin (1967) pp. 338, 340.
Houghton Mifflin (1972) pp. 311-313.

Book: 4

Houghton Mifflin (1967) pp. 184-185, 232-237.
Houghton Mifflin (1972) pp. 214-215,(54) 232-237, 349-350.
Addison-Wesley (1971, 1968) pp. 204-211, (34), 215-216, (46, 47), Supp. Ex. 35, 37.

Book: 5

Houghton Mifflin (1967) pp. 122-125, (36).
Houghton Mifflin (1972) pp. 143-145, 341.
Addison-Wesley (1971, 1968) pp. 125, 129, 333, (33).

Book: 6

Houghton Mifflin (1967) pp. 58-59, 110, #1-12.
Houghton Mifflin (1972) pp. 52-53, 57, #37-52, 70 #1-25, 325 Set II.
Addison-Wesley (1971, 1968) p. 57 # 1-12.

Other References:

Modern Mathematics Filmstrip 744: 1-19.

10-16 Level: 10 Step: A Concept: Geometry

I. Concept:

Geometry: Naming symmetrical figures.

II. Behavioral Objective:

The student given diagrams of a variety of figures will be able to name those which are symmetrical.

III. Mathematical Ideas:

A. A plane figure is said to be symmetrical about a line if the line separates it into two matching halves when one side is flipped over the line.

B. Some shapes have many lines of symmetry.

IV. Vocabulary To Stress:

symmetrical line figure symmetry line of symmetry

V. Activities:

*A. Children cut out paper patterns from paper which has been folded. The fold is a line of symmetry; the sides are congruent to each other along the line of symmetry. Children can cut out butterflies, doilies, snowflakes, etc.

*B. Use Mirror Cards to demonstrate symmetry.

C. Let's Play Games in Mathematics, Volume Three, Game No. 75.

*D. Have the children name the symmetrical capital letters of the alphabet (manuscript).

Text References:

Book: 3

Houghton Mifflin (1967) pp. 286-287, 310.
Houghton Mifflin (1972) pp. 288-289.

Book: 4

Houghton Mifflin (1967) pp. 80-82.
Houghton Mifflin (1972) pp. 96-97.

Book: 5

Houghton Mifflin (1967) pp. 282-283, (7C).
Houghton Mifflin (1972) pp. 293-294.

Book: 6

Houghton Mifflin (1967) p. 293.
Houghton Mifflin (1972) p. 301.

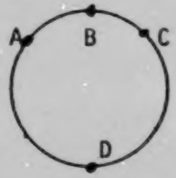
Other References:

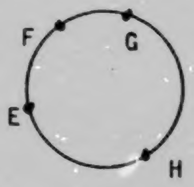
Franklin Series, Mirror Magic. Modern Mathematics Filmstrip 739.

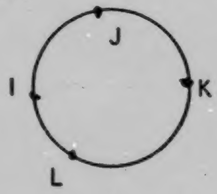
* Suggested Introductory Activity

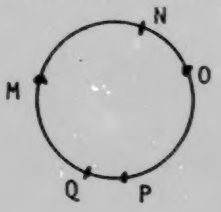
WORKSHEET

CONNECT THE POINTS THAT WILL SEPARATE THE CIRCLE INTO TWO MATCHING HALVES. THEN NAME THE LINE SEGMENT YOU HAVE DRAWN.



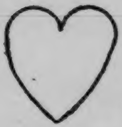






1. ____________ 2. ____________ 3. ____________ 4. ____________

DRAW A LINE SEGMENT TO SEPARATE EACH SHAPE INTO TWO PARTS THAT MATCH.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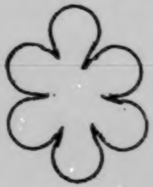
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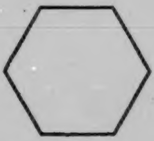
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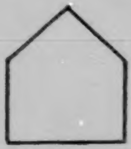
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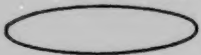
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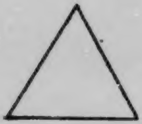
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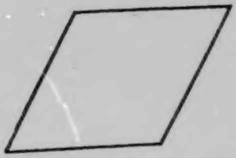
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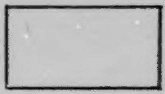
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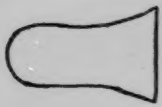
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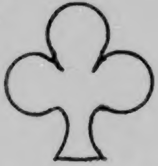
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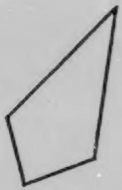
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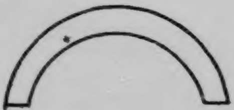
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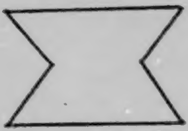
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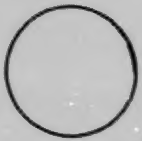
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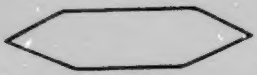

19.

DRAW 5 SHAPES OF YOUR OWN THAT CAN BE SEPARATED TO SHOW SYMMETRY.

DRAW 5 SHAPES OF YOUR OWN THAT CANNOT BE SEPARATED TO SHOW SYMMETRY.

10-18 Level: 10 Step: B Concept: Sets

I. Concept:

Sets: Using set notations

II. Behavioral Obejctive:

The student given sets and set notations "{ }", "n()", "∪" will be able to identify and write the notation with appropriate sets.

III. Mathematical Ideas:

A. The union of two sets is the set that contains all the members of the two sets.

B. The symbol for the union of sets is "∪".

C. The cardinal number of a set tells how many members there are in the set.

D. The symbol for cardinal number of a set is "n()".

E. An empty set is a set whose cardinal number is 0.

F. The emply set is a subset of every set.

IV Vocabulary To Stress:

members	cardinal number	equivalent
union of sets	empty set	braces

V. Activities:

*A. Use children, objects, attribute blocks to form sets; show union.

*B. Place four different objects in a paper bag. Suggest to the students that anything removed from the bag will be a subset of the set of objects placed in the bag. Let various students come up and reach into the bag as you hold it and describe the subset removed. Include in this procedure the idea that all the objects can be taken out, thus, the set itself is a subset.

C. See Level 7A Numeral.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 4-5, 222.
Houghton-Mifflin (1972) pp. 1-2.

Text References: continued

Book: 4

Houghton Mifflin (1967) pp. 2-4, 8, (2, 3).
Houghton Mifflin (1972) pp. 2, 4, (1).

Book: 5

Houghton Mifflin (1967) pp. 6, 7, (2, 3).
Houghton Mifflin (1972) pp. 4, 5, 29.
Addison-Wesley (1971, 1968) pp. 166, 167.

Book: 6

Houghton Mifflin (1967) pp. 2, 5, (1).
Houghton Mifflin (1972) pp. 1, 5.
Addison-Wesley (1971, 1968) p. 86.

Other References:

Imperial Tapes (Intermediate) #1 has all these plus intersection

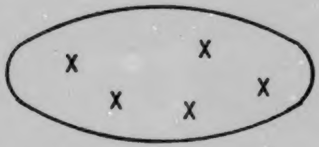
* Suggested Introductory Activity

10-20 Level: 10 Step: B Concept: Sets

WORKSHEET

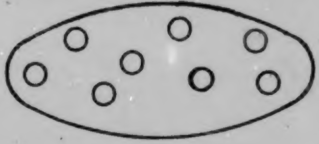
FIND THE CARDINAL NUMBER OF THE FOLLOWING SETS.

1. Set A



n(A) = ____________________

2. Set Z



n(Z) = ____________________

3. H = { 0, 1, 2, 3, 4, 5 }

n(H) = ____________________

4. J = { I, V, X, L, C }

n(J) = ____________________

WRITE THE CARDINAL NUMBER OF THE SET USING THE CORRECT NOTATION.

5. M = {△, ○, □, ▭}

_______ = __________

6. S = { δ, δ, δ, δ, δ, δ }

_______ = __________

7. X = { J, A, C, K }

_______ = __________

8. W = { d, t, l, f, h, k }

_______ = __________

9. O = { 2, 4, 6, 8, 10, 12, 14, 16 }

_______ = __________

10. Y = { $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{16}$, $\frac{7}{8}$, $\frac{9}{10}$, $\frac{11}{12}$, $\frac{14}{15}$ }

_______ = __________

11. A = { days of the week }

_______ = __________

12. B = { windows in this room }

_______ = __________

13. D = { boys in this room }

_______ = __________

14. E = { children in this room }

_______ = __________

WORKSHEET

UNION AND CARDINAL NUMBER.

1. Set A = { 1, 3, 5, 7, 9, 11 } Set B = { 4, 5, 6, 7, 8, 9, 10 }

1. n(A) = ________ 2. n(B) = ________

3. A∪B = ____

4. n(A∪B) = ____

Set C = { 1, 8, 6, 4 } Set E = { 3, 6, 9, 12 }

Set D = { 2, 8, 9, 7 } Set F = { 9, 10, 11, 12 }

5. C∪D = ____

6. n(C∪D) = ____

7. D∪E = ____

8. n(D∪E) = ____

9. W = { girls names in your room beginning with "J." } ________ = ________

10. X = { boys names in your room beginning with "J." } ________ = ________

LIST THE MEMBERS OF THE FOLLOWING SETS:

M = { months beginning with "M" } N = { days beginning with "T" }

11. M∪N = { ____ }

12. W∪X = { ____ }

I. Concept:

Numeral: Naming place value to billions.

II. Behavioral Objective:

The student given any 10 digit numeral will be able to name the place value of each digit.

III. Mathematical Ideas:

A. A digit in any place has ten times the value of the digit to its right.

B. The eighth digit from the right represents ten millions place.

C. The ninth digit from the right represents hundred millions place.

D. The tenth digit from the right represents one billions place.

E. A digit in our place value system has three meanings: place value, face value, total value. Ex. In the numeral 86,000,000 the 8 has a place value of ten millions, a face value of 8, and a total value of 80,000,000.

F. An expanded numeral names a numeral as the sum of the total value of its digits.

G. A compact numeral is the usual, short form of a numeral using place value.

IV. Vocabulary To Stress:

million	abacus	expanded numeral	place value
billion	compact numeral	total value	face value

V. Activities:

A. Let's Play Games in Mathematics: Volume Two - Games 11, 33, 36, 60.

*B. Use several individual abacuses to make one for billions. Lead students to discover that within each grouping there are ones, tens, and hundreds.

Text References:

Book: 4

Houghton Mifflin (1967) pp. 208, 209, (56).
Houghton Mifflin (1972) pp. 23-25, 174, 175, (45), 333.
Addison-Wesley (1971, 1968) pp. 14-17, 20-21.

Text References: continued

Book: 5

Houghton Mifflin (1967) pp. 13, 17-18.
Houghton Mifflin (1972) pp. 12, 13.
Addison-Wesley (1971, 1968) pp. 1, 2, 7, (1)

Book: 6

Houghton Mifflin (1967) p. 19.
Addison-Wesley (1971, 1968) p. 2, 3, 6.

* Suggested Introductory Activity

WORKSHEET

IN THE FOLLOWING NUMERALS GIVE THE TOTAL VALUE OF THE NUMBERS INDICATED.

1. 7,942,615,830

1 = ______________________ 6 = ______________________

2 = ______________________ 7 = ______________________

3 = ______________________ 8 = ______________________

4 = ______________________ 9 = ______________________

5 = ______________________

WRITE THE TOTAL VALUE IN WORDS FOR EACH OF THE NUMBERS INDICATED.

2. 5,207,384,196

1 = ______________________ 6 = ______________________

2 = ______________________ 7 = ______________________

3 = ______________________ 8 = ______________________

4 = ______________________ 9 = ______________________

5 = ______________________

WRITE THESE EXPANDED NUMERALS AS COMPACT NUMERALS.

3. 630,000,000 + 8,000,000 + 75,000 + 630 + 5 = ______________________

4. 508,000,000 + 720,000 + 8,000 + 64 = ______________________

5. 4,000,000,000 + 650,000 + 800 + 3 = ______________________

6. 300,000,000 + 1,000,000 + 39,000 + 40 + 8 = ______________________

WRITE THESE AS EXPANDED NUMERALS:

7. 7,804,360,521 = ____

____

8. 3,072,538,060 = ____

____

WORKSHEET

WRITE A COMPACT NUMERAL FOR THE FOLLOWING

1. Seven billion, three hundred forty million, five hundred thousand, eighty-four. ______

2. Two billion, four hundred eight million, sixty-five thousand, eight hundred seventy-three. ______

3. Five billion, eighty million, seven hundred forty-six thousand, twenty. ______

4. Nine hundred thirty-eight million, four thousand, five hundred ninety-two. ______

5. Seventy-eight million, eight hundred fifty four thousand, three hundred twenty-three. ______

6. Thirty million, fifty-four thousand, six hundred seventy-eight.

______

7. Five hundred thirty-eight billion, four hundred million, seventy eight thousand, forty. ______

WRITE THESE NUMERALS USING ONLY WORDS.

8. 5,630,578 ______

______

______

9. 7,908,053 ______

______

______

10. 586,730,219 ______

______

______

I. Concept:

Addition and Subtraction: Solving word problems involving addition or subtraction of fractions with like denominators equal to or less than one.

II. Behavioral Objective:

The student given word problems involving addition or subtraction of fractions less than or equal to one and having like denominators will be able to determine the operation and solve the problems expressing the answer in the simplest form.

III. Mathematical Ideas:

A. A fraction is a numeral which names a fractional number.

B. A fraction may be used to name a comparison between one or more equivalent parts and the total number of parts.

C. Fractional numbers may be added and subtracted.

D. For each set of equivalent fractions, we think of just one number. We call this number a rational number.

E. Any fraction from a set of equivalent fractions can be used to name the rational number for that set.

IV. Vocabulary To Stress: numerator denominator rational number fraction

V. Activities:

*A. The teacher can use egg cartons to demonstrate addition or subtraction of fractional numbers.

Text References:

Book: 3

Houghton Mifflin (1967) p. 177.

Book: 4

Houghton Mifflin (1967) pp. 295, 312.
Houghton Mifflin (1972) p. 266.

* Suggested Introductory Activity

Level: 10 Step: B Concept: Addition & Subtraction 10-27

WORKSHEET

DETERMINE THE OPERATION AND SOLVE THESE PROBLEMS. EXPRESS ANSWERS IN SIMPLEST EQUIVALENT FORM WHEN POSSIBLE. SHOW YOUR WORK.

1. Walter gave $\frac{1}{4}$ of his candy bar to Jerry and $\frac{1}{4}$ to Henry. How much of his candy bar did he give away?

2. Mike mowed $\frac{1}{5}$ of his lawn in the morning and $\frac{2}{5}$ in the afternoon. How much of the lawn did he mow in all?

3. Sally polished $\frac{3}{8}$ of the floor on one day and $\frac{5}{8}$ the next day. How much more did she polish on the second day?

4. There were 20 boxes of crayons at the store. By Saturday, $\frac{3}{20}$ of them were left. What part of the total group had been sold during the week?

5. If Michael mowed $\frac{1}{4}$ of his yard in the morning and $\frac{3}{4}$ in the afternoon, how much of the yard was mowed?

6. Lee mowed $\frac{1}{3}$ of his yard in the morning and $\frac{1}{3}$ after supper. How much of the yard did he mow?

7. Harry mowed $\frac{2}{4}$ of the lawn before lunch. He mowed $\frac{1}{4}$ of the lawn after lunch. How much lawn was mowed?

8. If Dad mowed $\frac{4}{6}$ of the yard and Freddie mowed $\frac{2}{6}$, how much more did Dad mow than Freddie?

WORKSHEET

SOLVE THESE PROBLEMS. EXPRESS ANSWERS IN SIMPLEST FORMS. SHOW YOUR WORK.

1. An ice cube tray holds 10 cubes of ice. If we use 3 of the cubes, we will have used $\frac{3}{10}$ of the ice in the tray. Later we used $\frac{4}{10}$ of the cubes. How much of the tray has been used?

2. Jimmy walks $\frac{1}{5}$ of a mile from his house to the school bus stop. He rides $\frac{3}{5}$ of a mile to school. Jimmy lives _______ of a mile from school.

3. John is taking a hike. He plans to hike 19 miles before dinnertime. By lunchtime John had hiked $\frac{9}{19}$ of the entire distance. Since lunchtime, he has hiked $\frac{5}{19}$ of the entire distance. So far, how much of the distance has he covered?

4. A small motel has 15 units. A family group rented 2 of the rooms. Some salesmen rented 3 of the rooms. What fractional part of the 15 units were rented?

5. A rental trailer fully loaded weighs $\frac{7}{9}$ of a ton. When it is empty, it weighs $\frac{2}{9}$ of a ton. What part of a ton is a full load?

6. Ann rides her bicycle $\frac{6}{7}$ of a mile to school. Jill rides her bicycle $\frac{4}{7}$ of a mile to school. Ann rides _____ of a mile further than Jill.

7. A 10-volume set of history books is kept on a library shelf. Right now, 3 of the books are out on loan. What part of the books are still on the shelf?

8. 17 cars were parked in a drive-in restaurant. 6 of the cars were blue. What fraction of the cars were not blue?

I. Concept:

Multiplication and Division: Solving word problems using multiplication involving 3 and 4-digit factors by 1 digit factor or division involving 4-digit product by 1-digit factor.

II. Behavioral Objective:

The student given word problems using multiplication involving 3 and 4-digit factors by 1-digit factor or division involving 4-digit product by 1-digit factor will be able to determine the operation and solve the problem.

III. Mathematical Ideas:

A. Word problems require finding another name for the cardinal number of the sets in the problem.

B. Mathematical thinking involves identifying the sets and distinguishing between joining and separating the sets.

IV. Vocabulary To Stress: factor product quotient

Text References:

Book: 3

Houghton Mifflin (1967) pp. 262, 339-340.
Addison-Wesley (1971, 1968) pp. 235, 237.

Book: 4

Houghton Mifflin (1967) pp. 165, 167.
Houghton Mifflin (1972) p. 195.
Addison-Wesley (1971, 1968) (36).

Book: 5

Houghton Mifflin (1967) pp. 107, 125.
Houghton Mifflin (1972) p. 73.

Book: 6

Houghton Mifflin (1972) p. 53, #25-31.

10-30 Level: 10 Step: B Concept: Multiplication and Division

WORKSHEET

SOLVE THE FOLLOWING PROBLEMS. SHOW YOUR WORK AND LABEL YOUR ANSWERS.

1. Dick and Jim have a junk yard. Their profit for the last 4 months was $4,296. If they divide the profit equally between them, how much does each one get?

2. The distance around a race track is 350 yards. How far does a runner go if he circles the track 3 times?

3. A rocket goes 240 miles in one minute. How far will it go 8 minutes?

4. One railroad freight car weighs 462 pounds. How much do 4 freight cars weigh?

5. If a plane flies 3,190 miles in 5 hours, how far will it fly in 1 hour?

6. There are 4 men in a jazz combo. The combo earned $1,260 in one week. How much did each member earn?

7. The Dolan Manufacturing Company has 8 warehouses. Each warehouse has 416 square feet. How many square feet are in all 8 buildings?

8. Mr. Jones bought a used car for $520. He wants to pay for it in 8 months. How much will he pay each month?

WORKSHEET

SOLVE THE FOLLOWING PROBLEMS. SHOW YOUR WORK.

1. There are 4,536 seats in a large theater. The seats are divided into 9 sections with the same number in each section. There are __________ in each section.

2. A florist ordered 2,232 carnations from the nursery. When the flowers arrived, the florist made them into corsages. He used 6 carnations for each corsage. How many corsages did he make?

3. The Carter family rented a trailer to move their furnishings across town. The trailer held 3,085 pounds. If it took 6 trips with the trailer loaded to capacity, how many pounds of furnishings did they move?

4. There were 8,965 paid admissions at the ballgame. If the same number of people attend the next six games, how many people will have paid to see the games?

5. There are 3 feet in a yard. The shopping center is 198 feet from the police station. How many yards apart are they?

6. The Missouri Theater seats 385 people. Seven performances were sold out when they did "Snow White and the Seven Dwarfs." How many people saw the shows?

7. One school had an enrollment of 618 children each year for three years straight. How many children attended school all three years?

8. Tom wants to ride his motorcycle from his hometown to Boston in 4 days. The distance is 868 miles. How far must he travel each day?

10-32 Level: 10 Step: B Concept: Geometry

I. Concept:

Geometry: Identifying properties of intersecting, congruent, and perpendicular line segments.

II. Behavioral Objective:

The student given line segments will be able to identify intersecting, congruent, and perpendicular properties of line segments or lines.

III. Mathematical Ideas:

A. A line segment is part of a line between two end points.

B. The intersection of two line segments is a single point.

C. Two line segments of the same length are congruent.

D. A horizontal ray and vertical ray join to form a "square corner" or right angle.

E. A ray that forms two right angles with a line is perpendicular to the line.

IV. Vocabulary To Stress:

intersection	perpendicular	right angle
congruent	line segment	ray

V. Activities:

*A. Have the children find congruent and perpendicular line segments in the room. Have the class measure objects, books, desks, etc., to see if any of the lines are congruent. Find lines on the playground or the way home that are congruent.

Text References:

Book: 3

Houghton Mifflin (1967) p. 289 (rt. <).
Houghton Mifflin (1972) p. 102 (rt. <).

Book: 4

Houghton Mifflin (1967) pp. 67, 72, 74.
Houghton Mifflin (1972) pp. 99.

Book: 5

Houghton Mifflin (1967) pp. 64. 68, 72.
Addison-Wesley (1971, 1968) pp. 76-82, 94-95.

Book: 6

Houghton Mifflin (1972) p. 97.
Addison-Wesley (1971, 1968) pp. 116-118.

* Suggested Introductory Activity

Level: 10 Step: B Concept: Geometry 10-33

WORKSHEET

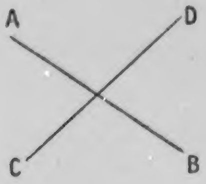
MATCH THE DIAGRAM WITH THE TERM THAT DESCRIBES IT.

A. Congruent line segments

B. Intersecting line segments

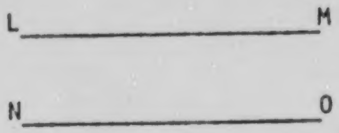
C. Perpendicular line segments

1



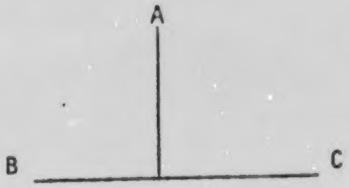
1. ________

2.



2. ________

3.



3. ________

DRAW 3 SETS OF INTERSECTING LINE SEGMENTS THAT ARE NOT PERPENDICULAR.

4. 5. 6.

DRAW 3 SETS OF PERPENDICULAR LINE SEGMENTS; PUT AN "X" INSIDE EACH RIGHT ANGLE

7. 8. 9.

I. Concept:

Measurement: Reading the temperature on a Fahrenheit thermometer.

II. Behavioral Objective:

The studetn given drawing of a Fahrenheit thermometer will be able to name the temperature indicated with a degree symbol.

III. Mathematical Ideas:

A. A thermometer measures how hot or cold something is.

B. Temperature is measured in units called degrees.

C. The symbol for degrees is °.

D. On the thermometer scale only 10-degree marks have numerals.

E. On the Fahrenheit thermometer every mark usually stands for 2-degrees.

F. The boiling point on the Fahrenheit thermometer is 212°.

G. The freezing point on the Fahrenheit thermometer is 32°.

H. The centigrade thermometer is metric oriented and is also called Celsius. The term Celsius is currently used.

I. When measuring temperatures below zero the measurement begins at zero and increases going downward.

IV. Vocabulary To Stress:

thermometer
temperature
degree
Fahrenheit
centigrade (Celsius)
calibrate

V. Activities:

A. Record daily temperature. Make a thermometer and calibrate it.

B. Have children bring in as many different kinds of thermometers to share with the class (oven, candy, meat, etc.).

Text References:

Book: 4

Addison-Wesley (1971, 1968) p. 217.

Book: 5

Addison-Wesley (1971, 1968) p. 237.

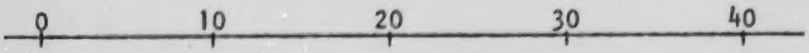
Book: 6

Addison-Wesley (1971, 1968) p. 55.

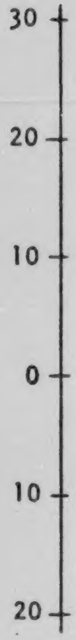
Level: 10 Step: B Concept: Measurement 10-35

WORKSHEET

You have worked with a number line like this:



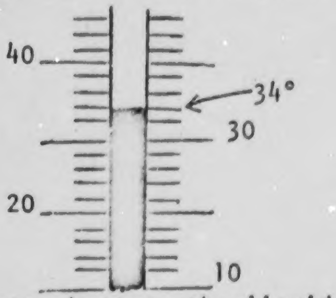
Now we will work with a vertical number line like this:


30
20
10
0
10
20

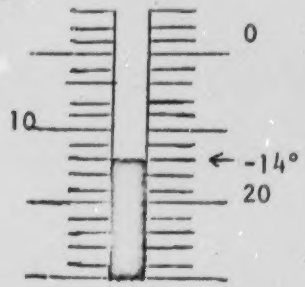
You notice the numbers are the same but are written on alternate sides of the line.

On a thermometer every mark represents 2-degrees though only 10-degree marks have numerals.

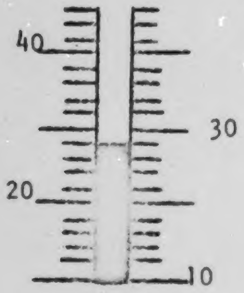
This thermometer shows a temperature of 34 degrees

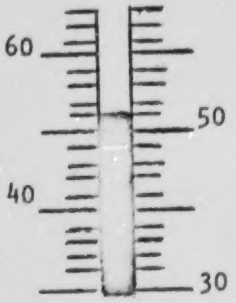

40
-34°
30
20
10

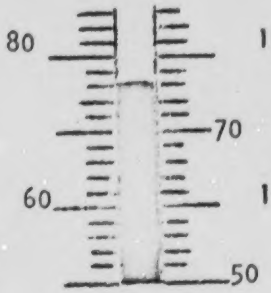
When it is very cold the temperature is below zero. The thermometer is read from the zero mark downwards. This thermometer shows a temperature of -14°.

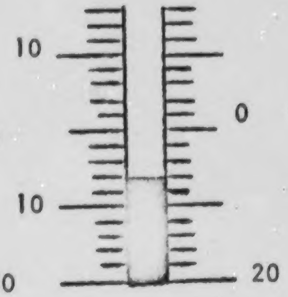


As the temperature gets hotter, the liquid in the thermometer goes up; when it gets colder it goes down. What temperatures do these thermometers show?







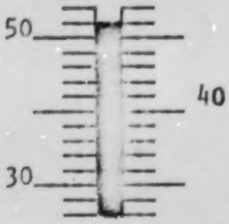


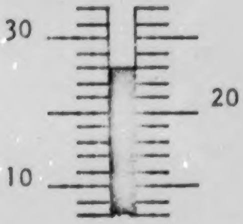
A. ________ B. ________ C. ________ D. ________

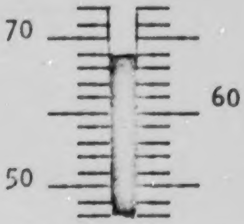
10-36 Level: 10 Step: B Concept: Measurement

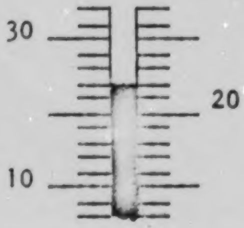
WORKSHEET

READ THESE THERMOMETERS. WHAT ARE THEIR TEMPERATURES?

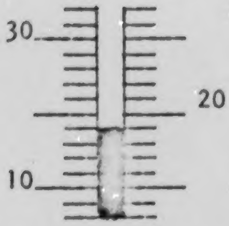


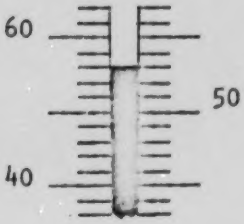


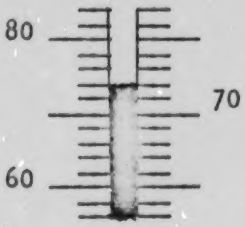


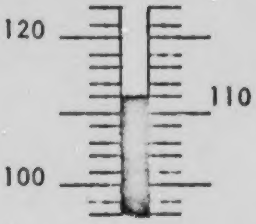


A. ______ B. ______ C. ______ D. ______





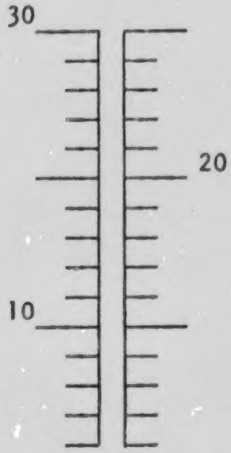




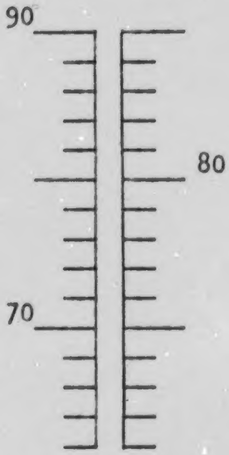
E. ______ F. ______ G. ______ H. ______

SHADE IN THE THERMOMETERS TO SHOW THE TEMPERATURES GIVEN.

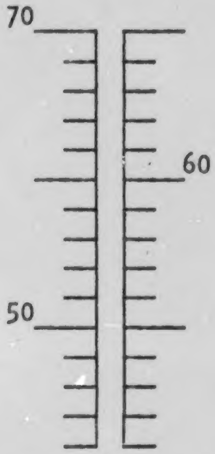
I. 28°



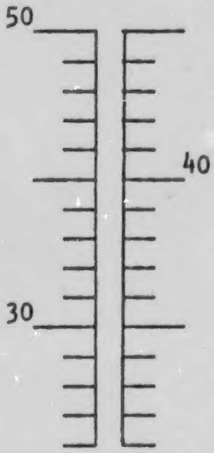
II. 86°



III. 64°



IV. 32°

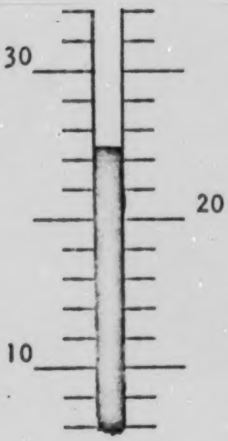


Level: 10 Step: B Concept: Measurement 10-37

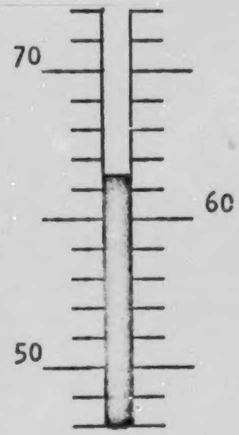
WORKSHEET

IF ONE SPACE BETWEEN MARKS ON THE THERMOMETER SCALE STANDS FOR 2-DEGREES, $\frac{1}{2}$ SPACE OR HALFWAY BETWEEN THE MARKS WILL STAND FOR 1-DEGREE.

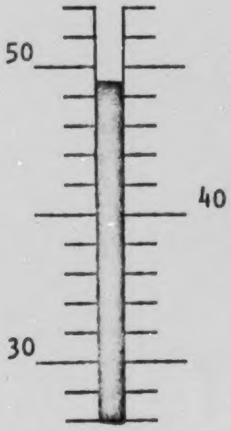
READ THESE CELSIUS THERMOMETERS. WHAT ARE THEIR TEMPERATURES?



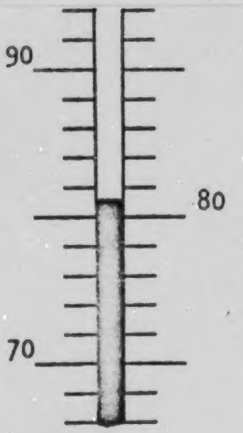
A. ______



B. ______

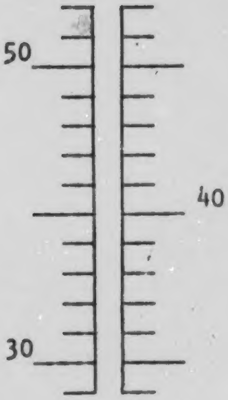


C. ______

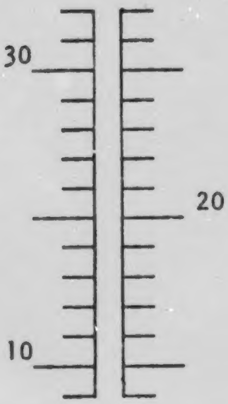


D. ______

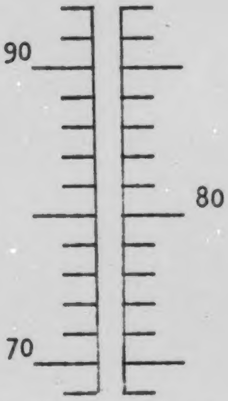
SHADE IN THE THERMOMETER TO SHOW THE TEMPERATURES GIVEN.



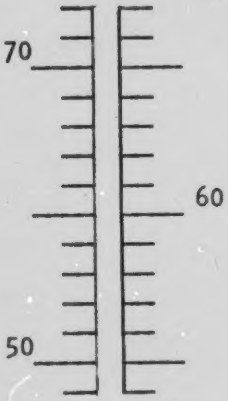
E. 45°



F. 29°



G. 83°



H. 67°

10-38 Level: 10 Step: B Concept: Measurement

WORKSHEET

READ THESE PROBLEMS AND WORK THEM. SHOW YOUR WORK.

1. Water freezes at 32°. The temperature was 45° at 9 p.m. How much above freezing was this?

2. The temperature in the freezer stays at 26°. How much below the freezing point is this?

3. The lake temperature was 58° at 7 a.m. By noon it was 71°. How much warmer did it get?

4. Thursday morning the temperature was 43°. On Friday it was 29°. How much had the temperature dropped?

5. In May the average temperature was 64°. In June the average temperature was 75°. On the average, how much warmer was it in June?

6. Water boils at 212°. The hottest day on record in Jamestown is 119°. How much below the boiling point is this?

MAKE UP 2 STORY PROBLEMS OF YOUR OWN INVOLVING TEMPERATURE. WORK EACH PROBLEM.

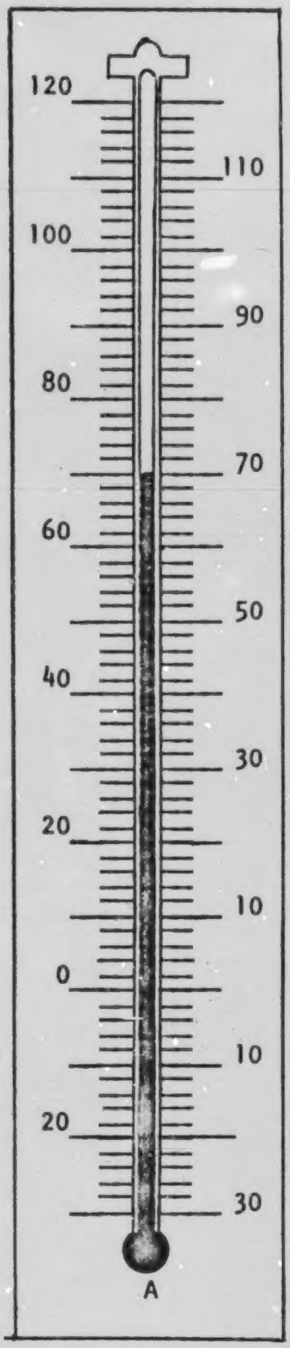
7.

8.

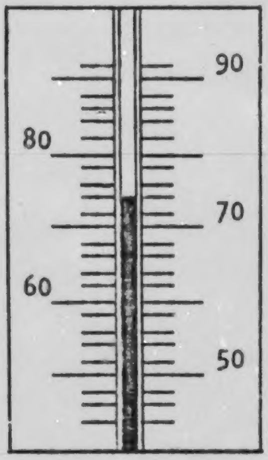
Level: 10 Step: B Concept: Measurement 10-39

WORKSHEET

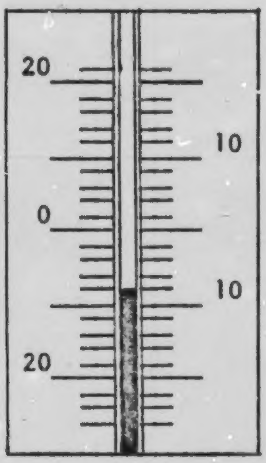
A thermometer shows how cold or warm the air around it is. Answer the questions about these thermometers below.



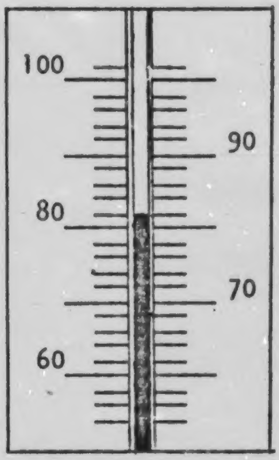
A



B



C



D

1. What does thermometer A show? ____

2. What temperature does thermometer B show? ____

3. What temperature does thermometer C show? ____

4. What temperature does thermometer D show? ____

TIM KEPT A RECORD OF THE TEMPERATURE FOR ONE WEEK.

Sun	Mon	Tue	Wed	Thur	Fri	Sat
36	30	18	32	34	39	56

5. Which was the coldest day? ____

6. Which was the warmest day? ____

7. How much warmer was it on Saturday than on Sumday? ____

8. How many degrees below freezing was it on Tuesday? ____

9. How many degrees above freezing was it on Thursday? ____

10. In Tim's home the temperature was kept at 72°. If the thermometer were brought into the house on Saturday, how many degrees would it rise? ____

11. What is the difference in temperature between the coldest day of the week and the warmest day? ____

10-40 Level: 10 Step: Z Concept: Sets

I. Concept:

Sets: Matching the members of two sets using the symbol $\otimes$ (cross product) to form ordered pairs.

II. Behavioral Objective:

The student given two sets and $\otimes$ (symbol for cross products) will be able to match each element of one set with each element of the second set, finding all possible matchings.

III. Mathematical Ideas:

A. Matching all the elements in one set with all the elements in another set results in a set of ordered pairs called the cross product.

B. $\otimes$ is the symbol for cross products.

C. The cardinal number of the cross-product of two sets is the product of the cardinal numbers of the sets. $n(A) \times n(B) = n(A \otimes B)$

D. The number pair must be an ordered pair.

IV. Vocabulary To Stress:

order
cardinal number
matching
pairing
ordered pair
elements
cross product

V. Activities:

*A. Houghton Mifflin (1972) Book 3, p. T267. Give the children sheets of different colored papers and a like number of different colored crayons. Ask the students to name all the color combinations that can be formed and then form an equation. Since some of the colors are the same, it is important to always name the color of the paper first, crayon second.

Another way to give children experience with cross products is to put a chair, a desk, a stool, and a rug in the front of the room and ask three children to come forward. If you wanted to take a picture of each child on each seat, how many pictures would you have to take? Write the cross products on the board listing the child first, seat second. The same idea can be used matching drinks (coffee, tea, milk) to foods (hamburger, hot dog).

V. Activities: continued

B. Houghton Mifflin (1972) Book 3, p. T269. Some students may do problems using abstract symbols alone. For example, you could give them the following sets to multiply:

Set A = (1, 2) A x B = { (1,a),____,____,____ }

Set B = (a,b) B x A = {____,____,____,____ }

Set C = (d,e,f) A x C = {___,___,___,___,___,___ }

C. See Houghton Mifflin Teachers Edition 5, pp. 134-135.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 204-207
Houghton Mifflin (1972) pp. 205-207, (53, 54).
Addison-Wesley (1971, 1968) pp. 120-123.

Book: 4

Houghton Mifflin (1967) pp. 100-103, (24).
Houghton Mifflin (1972) pp. 64-67.
Addison Wesley (1971, 1968) pp. 104-107.

Book: 5

Houghton Mifflin (1967) pp. 100 (26), 134, (39).
Houghton Mifflin (1972) pp. 64, 65, (17).

Book: 6

Houghton Mifflin (1967) pp. 8-9, (2), 42.

Book: 7

Houghton Mifflin (1972) p. 326.

Other References:

Modern Mathematics Filmstrip 746

* Suggested Introductory Activity

WORKSHEET

PAIR EACH MEMBER OF THE FIRST SET WITH EACH MEMBER OF THE SECOND SET TO FORM A SET OF ORDERED PAIRS.

1. $A = \{b,c\}$ $B = \{8,4,6\}$

   $A \otimes B = \{(\_\_), (\_\_), (\_\_), (\_\_), (\_\_), (\_\_)\}$

2. $C = \{m,p,r\}$ $D = \{3,5,2\}$

   $C \otimes D =$ ______________________________

3. $M = \{$△, ▯$\}$ $N = \{a,b,c\}$

   $M \otimes N =$ ______________________________

4. $R = \{$△, ○, ▭$\}$ $S = \{$△, ⌭$\}$

   $R \otimes S =$ ______________________________

COMPLETE THE FOLLOWING EQUATIONS USING THE SETS GIVEN ABOVE.

5. $n(R \otimes N) =$ ________

6. $n(A \otimes D) =$ ________

7. $n(S \otimes M) =$ ________

8. $n(C \otimes S) =$ ________

9. $n(M \otimes B) =$ ________

10. $n(R \otimes A) =$ ________

EVALUATION

COMPLETE THE EQUATIONS USING THE SETS GIVEN.

$A = \{\triangle, \square\}$ $B = \{5,9,6\}$ $C = \{b,g\}$

1. $n(A \otimes B) =$ ________ 2. $n(C \otimes A) =$ ________

3. $B \otimes C =$ ____

4. $C \otimes A =$ ____

5. $A \otimes B =$ ____

I. Concept:

Numeral: Renaming Roman numerals as Hindu-Arabic and Hindu-Arabic as Roman numerals.

II. Behavioral Objective:

The student given a Hindu-Arabic numeral or a Roman numeral from 1-1999 will be able to rename Roman numerals as Hindu-Arabic and Hindu-Arabic as Roman numerals.

III. Mathematical Ideas:

A. The symbols for Roman numerals are I, V, X, L, C, D, M.

B. The basic symbols in the Roman system are combined to form numerals.

C. If a smaller number follows a larger number they are added.

D. If a smaller precedes a larger number, it is subtracted from the larger number.

IV. Vocabulary To Stress: Roman numerals Hindu-Arabic numerals

V. Activities:

*A. Number the following things in Roman numerals: desk, numbers on the clock, room numbers in the building, days on the calendar, date.

*B. Find as many examples of the uses of Roman numerals as you can.

C. The Missing Roman. Preparation and Materials: Write on the board Roman numerals from 50 to 100, 100 to 150, etc. 900 to 950, 950 to 1000, different combinations on different days. How to Play: The teacher places the Roman numerals from 100-150 on board. The class is divided into two teams. The first member of Team A is asked to close his eyes. The teacher erases three of the numbers. If the Team A member can replace the numbers the teacher erased, his team gets a point. If not, the first member of Team B gets a chance and so on. The teacher continues to do the erasing. The team with the most points wins.

V. Activities: continued

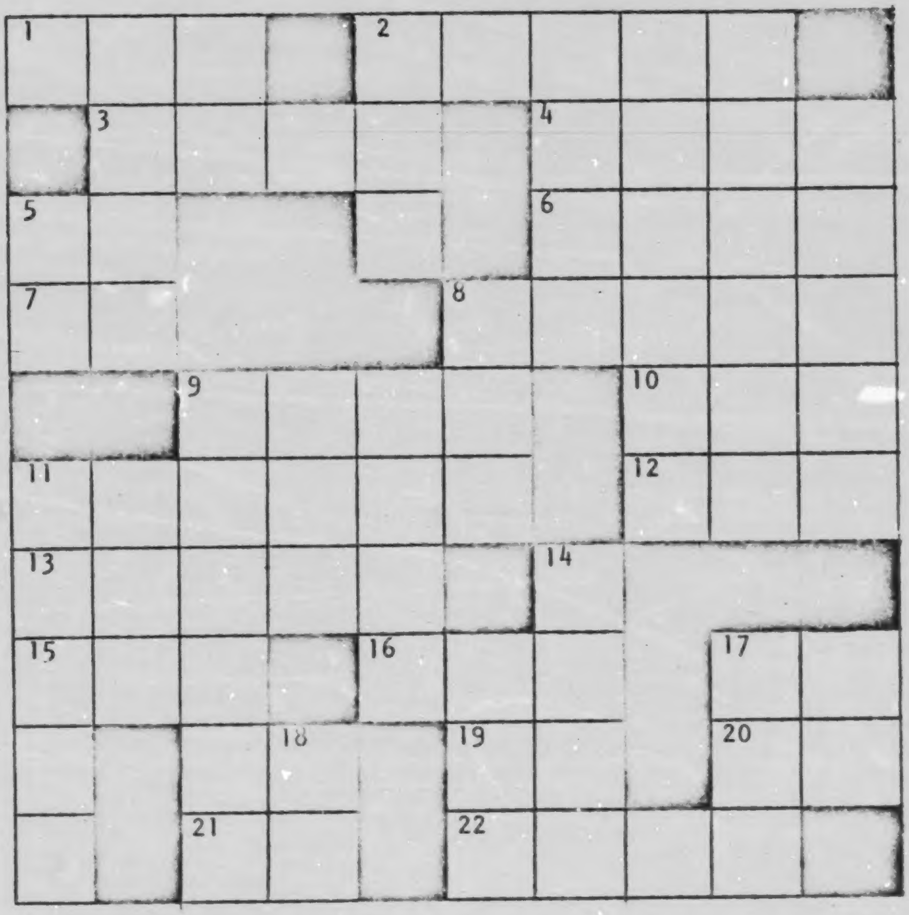
D. Write the correct Roman numeral in the puzzle.

Across

1. 45
2. 39
3. 26
4. 99
5. 9
6. 49
7. 15
8. 76
9. 909
10. 30
11. 1,355
12. 54
13. 245
14. 1,000
15. 1,150
16. 1,200
17. 400
18. 100
19. 200
20. 1,100
21. 6
22. 114

Down

1. 10
2. 14
5. 9
8. 65
9. 244
11. 1,940
14. 1,210
17. 905
18. 101


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

10-46 Level: 10 Step: Z Concept: Numeral

Text References:

Book: 4

Houghton Mifflin (1967) pp. 22-23, (6).
Houghton Mifflin (1972) pp. 28.

Book: 5

Addison-Wesley (1971, 1968) p. 14.

Book: 6

Houghton Mifflin (1967) p. 22.

Book: 7

Houghton Mifflin (1967) pp. 107-111, (16).
Addison-Wesley (1971, 1968) pp. 29-30.

* Suggested Introductory Activity

WORKSHEET

CHANGE THE HINDU-ARABIC NUMERALS TO ROMAN NUMERALS:

1. 75 ______
2. 86 ______
3. 1,472 ______
4. 904 ______
5. 1,728 ______

CHANGE THE ROMAN NUMERALS TO HINDU-ARABIC NUMERALS AS SHOWN:

CCLXIX = 100 + 100 + 50 + 10 + 9 = 269

6. DCCXVII ______ = ______
7. MDCL ______ = ______
8. MCMXXIV ______ = ______
9. MDCCLXXIII ______ = ______
10. MDCLVII ______ = ______
11. CDLIX ______ = ______
12. CCCXV ______ = ______
13. MCMLXXIX ______ = ______
14. DCXLV ______ = ______

EVALUATION

RENAME THESE HINDU-ARABIC NUMERALS AS ROMAN NUMERALS.

1. 375 ______________
2. 1426 ______________
3. 89 ______________
4. 1973 ______________
5. 632 ______________

RENAME THESE ROMAN NUMERALS AS HINDU-ARABIC NUMERALS.

6. CCLXXIV ____________
7. XCVII ____________
8. DCXXXVI ____________
9. MCCCLIX ____________
10. MCMXLII ____________

I. Concept:

Addition and Subtraction: Finding the missing digit.

II. Behavioral Objective:

The student given an addition or subtraction problem with no more than four missing digits will be able to determine the missing digits.

III. Mathematical Ideas:

A. Subtraction is the process of renaming a sum and an addend as a missing addend.

B. Every numeral has many names.

C. Addition is associative; consequently, $43 = 40 + 3$ may be renamed as $30 + 13$.

IV. Vocabulary To Stress: digit missing addend

Text References:

Book: 3

Addison-Wesley (1971, 1968) p. (32).

Book: 4

Addison-Wesley (1971, 1968) pp. 39, #2, 58, #3, (13), 325, Set 15.

Book: 5

Addison-Wesley (1971, 1968) p. 27, (7).

Book: 6

Addison-Wesley (1971, 1968) p. 324, Set 9.

10-50

Level: 10 Step: Z Concept: Addition and Subtraction

WORKSHEET

Find the missing digit for each □.

1. 23 +□6 69	2. □4 -22 42	3. □6 +3□ 88	4. 6□ +□5 89	5. 8□ -□3 36
6. 49 +□□ 89	7. □9 -18 71	8. □□ -12 80	9. 22 +□□ 69	10. 36 +2□ □2
11. □7 +13 6□	12. □9 -2□ 26	13. 32 -□□ 14	14. 4□ +□5 89	15. 85 -□□ 55
16. □□ -36 14	17. 6□ +□9 92	18. 4□ -□3 6	19. 5□ +□2 115	20. □□ -17 26
21. □4 +7□ 159	22. 5□ -13 □7	23. □8 -8□ 9	24. 1□ +94 1□7	25. 36 +□□ 135

Level: 10　　Step: Z　　Concept: Addition and Subtraction

WORKSHEET

Find the missing digit for each □ .

1. $$\begin{array}{r} 1\,1\,\square \\ -\ 5\,4 \\ \hline \square\,2 \end{array}$$

2. $$\begin{array}{r} 3\,\square\,2 \\ +\ \square\,3\,\square \\ \hline 8\,7\,9 \end{array}$$

3. $$\begin{array}{r} \square\,\square\,\square \\ +\ 3\,1\,5 \\ \hline 9\,9\,9 \end{array}$$

4. $$\begin{array}{r} \square\,\square\,6 \\ -\ 7\,\square \\ \hline 7\,5 \end{array}$$

5. $$\begin{array}{r} 1\,4\,6 \\ +\ \square\,\square\,\square \\ \hline 6\,4\,8 \end{array}$$

6. $$\begin{array}{r} 6\,3\,\square \\ +\ \square\,1 \\ \hline \square\,5\,8 \end{array}$$

7. $$\begin{array}{r} 1\,\square\,\square \\ -\ 8\,2 \\ \hline 9\,6 \end{array}$$

8. $$\begin{array}{r} \square\,\square\,\square \\ -\ 7\,3 \\ \hline 9\,6 \end{array}$$

9. $$\begin{array}{r} 7\,\square\,5 \\ -\ \square\,2\,\square \\ \hline 3\,4\,2 \end{array}$$

10. $$\begin{array}{r} 5\,8\,6 \\ -\ \square\,\square\,\square \\ \hline 4\,4\,5 \end{array}$$

11. $$\begin{array}{r} \square\,3\,\square \\ +\ 3\,\square\,3 \\ \hline 7\,8\,8 \end{array}$$

12. $$\begin{array}{r} 8\,\square\,7 \\ -\ \square\,2\,\square \\ \hline 5\,5\,6 \end{array}$$

13. $$\begin{array}{r} 7\,\square\,\square \\ -\ \square\,4\,2 \\ \hline 4\,7 \end{array}$$

14. $$\begin{array}{r} 8\,\square\,\square \\ +\ \square\,5\,7 \\ \hline 1\,4\,8\,9 \end{array}$$

15. $$\begin{array}{r} \square\,9\,6 \\ +\ \square\,\square \\ \hline 2\,6\,3 \end{array}$$

16. $$\begin{array}{r} 4\,7\,\square \\ -\ \square\,4 \\ \hline \square\,6\,5 \end{array}$$

17. $$\begin{array}{r} 4\,\square \\ +\ \square\,5 \\ \hline 7\,7 \end{array}$$

18. $$\begin{array}{r} \square\,\square \\ +\ 4\,5 \\ \hline 1\,2\,8 \end{array}$$

19. $$\begin{array}{r} 5\,\square \\ +\ 3\,5 \\ \hline 9\,4 \end{array}$$

20. $$\begin{array}{r} \square\,7 \\ +\ 4\,\square \\ \hline 1\,1\,1 \end{array}$$

21. $$\begin{array}{r} 5\,6 \\ +\ \square\,\square \\ \hline 1\,4\,5 \end{array}$$

22. $$\begin{array}{r} \square\,\square\,\square \\ -\ 2\,6\,4 \\ \hline 2\,7\,4 \end{array}$$

23. $$\begin{array}{r} 8\,\square\,3 \\ -\ \square\,4\,8 \\ \hline 5\,0\,\square \end{array}$$

24. $$\begin{array}{r} \square\,7\,3 \\ -\ 1\,\square\,\square \\ \hline 3\,4\,8 \end{array}$$

25. $$\begin{array}{r} 7\,2\,7 \\ -\ \square\,\square\,\square \\ \hline 2\,6\,0 \end{array}$$

26. $$\begin{array}{r} 9\,\square\,3 \\ -\ 4\,8\,8 \\ \hline \square\,0\,\square \end{array}$$

27. $$\begin{array}{r} 5\,8\,\square \\ -\ 2\,\square\,6 \\ \hline \square\,8\,2 \end{array}$$

10-52 Level: 10 Step: Z Concept: Addition & Subtraction

EVALUATION

1.
$$\begin{array}{r} 9\,6 \\ +\,\square\,\square \\ \hline 1\,6\,5 \end{array}$$

2.
$$\begin{array}{r} \square\,0\,\square\,7 \\ +\,2\,\square\,6\,\square \\ \hline 7\,4\,0\,6 \end{array}$$

3.
$$\begin{array}{r} \square\,4\,6 \\ +\,5\,\square\,\square \\ \hline 8\,7\,3 \end{array}$$

4.
$$\begin{array}{r} \square\,7\,6 \\ +\,9\,\square\,4 \\ \hline 1\,5\,6\,\square \end{array}$$

5.
$$\begin{array}{r} 8\,\square\,2 \\ +\,9\,\square \\ \hline \square\,3\,7 \end{array}$$

6.
$$\begin{array}{r} 8\,8\,4 \\ -\,\square\,\square\,6 \\ \hline 3\,3\,\square \end{array}$$

7.
$$\begin{array}{r} 4\,\square\,2 \\ -\,\square\,8\,\square \\ \hline 2\,7\,5 \end{array}$$

8.
$$\begin{array}{r} \square\,4\,6 \\ -\,4\,\square\,7 \\ \hline 3\,8\,\square \end{array}$$

9.
$$\begin{array}{r} 9\,5\,\square\,3 \\ -\,3\,8\,9\,\square \\ \hline \square\,6\,6\,9 \end{array}$$

10.
$$\begin{array}{r} 7\,\square\,3\,\square \\ -\,\square\,8\,7\,9 \\ \hline 4\,5\,\square\,7 \end{array}$$

Step A
10-3 Sets

1. $\frac{5}{5} = 1$ 2. $\frac{7}{7} = 1$

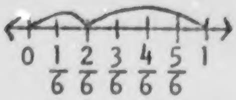
3. $\frac{4}{4} = 1$ 4. $\frac{6}{6} = 1$

5. $\frac{5}{7}$, 1 6. $\frac{5}{8}$, 1

7. $\frac{1}{2}$, 1 8. $\frac{4}{10}$, 1

9. $\frac{4}{4}$, (1) $\frac{2}{4} = \frac{4}{4}$ (1)

10. $\frac{5}{5}$

11.


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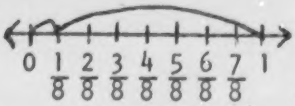

10-6 Numeral

1. 2/7
2. 4/5
3. 1/4
4. 3/4
5. 9/10
6. 5/6
7. 4/5
8. 1/2
9. 1/4
10. 1/2
11. 5/6
12. 1/3
13. 3/5
14. 1/3
15. 1/3
16. 5/7
17. 4/7
18. 2/3
19. 1/2
20. 3/8
21. 1/2
22. 4/5
23. 3/4
24. 3/4
25. 3/4
26. 5/8
27. 2/3
28. 1/2
29. 5/6
30. 1/2

Step A
10-9 Addition

a. 4/5
b. 3/6, 1/2
c. 6/8, 3/4
d. 3/9, 1/3
e. 4/12, 1/3
f. 10/15, 2/3
g. 5/10, 1/2
h. 7/8
i. 8/16, 1/2
j. 4/8, 1/2
k. 9/12, 3/4
l. 10/14, 5/7
m. 3/15, 1/5
n. 5/9
o. 8/10, 4/5
p. 2/4, 1/2
q. 6/9, 2/3
r. 6/10, 3/5
s. 4/16, 1/4
t. 12/20, 3/5
u. 12/24, 1/2
v. 5/15, 1/3
w. 4/10, 2/5
x. 12/16, 3/4

10-13 Subtraction

a. 6/8, 3/4
b. 3/6, 1/2
c. 3/12, 1/4
d. 5/8
e. 2/10, 1/5
f. 3/14
g. 4/8, 1/2
h. 3/9, 1/3
i. 5/15, 1/3
j. 5/10, 1/2
k. 4/12, 1/3
l. 7/9
m. 8/16, 1/2
n. 8/12, 2/3
o. 3/6, 1/2
p. 3/15, 1/5
q. 10/20, 1/2
r. 9/18, 1/2
s. 12/24, 1/2
t. 15/30, 1/2
u. 4/14, 2/7
v. 7/12
w. 10/15, 2/3
x. 8/16, 1/2

Step A
10-17 Geometry

1. BD
2. FH
3. IK
4. QN
5-19 Answers will vary

Step B
10-20 Sets

1. 5
2. 8
3. 6
4. 5
5. n(M) = 4
6. n(S) = 6
7. n(X) = 4
8. n(W) = 6
9. n(O) = 8
10. n(Y) = 7
11. n(A) = 7
12-14 answers will vary

10-21 Sets

1. 6
2. 7
3. {1,3,4,5,6,7,8,9,10}
4. 9
5. {1,2,4,6,7,8,9}
6. 7
7. {2,3,6,7,8,9,12}
8. 7
9. varies
10. varies
11. {March, May, Tuesday, Thursday}
12. varies

Step B

10-24 Numeral

1. 1 = 10,000
   2 = 2,000,000
   3 = 30
   4 = 40,000,000
   5 = 5,000
   6 = 600,000
   7 = 7,000,000,000
   8 = 800
   9 = 900,000,000
2. 1 = one hundred
   2 = two hundred million
   3 = three hundred thousand
   4 = four thousand
   5 = five billion
   6 = six
   7 = seven million
   8 = eighty thousand
   9 = ninety
3. 638,075,635
4. 508,728,064
5. 4,000,650,803
6. 301,039,048
7. 7,000,000,000 + 800,000,000 + 4,000,000
   300,000 + 60,000 + 500 + 20 + 1
8. 3,000,000,000 + 70,000,000 + 2,000,000 +
   500,000 + 30,000 + 8,000 + 60

10-25 Numeral

1. 7,340,500,084
2. 2,480,065,873
3. 5,080,746,020
4. 938,004,592
5. 78,854,323
6. 30,054,678
7. 538,400,078,040
8. Five million, six hundred thirty thousand, five hundred seventy-eight
9. Seven million, nine hundred eight thousand, fifty-three
10. Five hundred eighty-six million, seven hundred thirty thousand, two hundred nineteen

10-27 Addition & Subtraction

1. 2/4 or 1/2
2. 3/5
3. 2/8 or 1/4
4. 17/20
5. 4/4 or 1
6. 2/3
7. 3/4
8. 2/6 or 1/3

10-28 Addition & Subtraction

1. 7/10
2. 4/5
3. 14/19
4. 5/15 or 1/3
5. 5/9
6. 2/7
7. 7/10
8. 9/17

Step B

10-30 Multiplication & Division

1. $1074
2. 1050 yards
3. 1920 miles
4. 1848 lbs.
5. 638 miles
6. $315
7. 3328 sq. feet
8. $65

10-31 Multiplication & Division

1. 504
2. 372
3. 18,510 lbs.
4. 53,790 people
5. 66 yards
6. 2695 people
7. 2454 children
8. 217 miles

10-33 Geometry

1. B
2. A
3. C

4-9 varies

10-35 Measurement

A. 28°
B. 52°
C. 76°
D. 14°

10-36 Measurement

A. 52°
B. 26°
C. 68°
D. 24°
E. 18°
F. 56°
G. 74°
H. 112°

Step B

10-37 Measurement

A. 25° C
B. 63° C
C. 49° C
D. 81° C

10-38 Measurement

1. 13°
2. 6°
3. 13°
4. 14°
5. 11°
6. 93°

10-39 Measurement

1. 70°
2. 74°
3. 12°
4. 82°
5. Tuesday
6. Saturday
7. 20°
8. 14°
9. 2°
10. 16°
11. 38°

Step Z

10-42 Sets

1. {(b,8) (b,4) (b,6)
(c,8) (c,4) (c,6)}
2. {(m,3) (m,5) (m,2) (p;5)
(p,2) (r,3) (r,5) (r,2)}
3. {($\overset{\triangle}{m}$,a) ($\overset{\triangle}{m}$,b) ($\overset{\triangle}{m}$,c)
($\overset{\square}{n}$,a) ($\overset{\square}{n}$,b) ($\overset{\square}{n}$,c)}
4. {(☆△) (☆⌭) (○△)
(○⌭) (▭△) (□⌭)}
5. 9
6. 6
7. 4
8. 6
9. 6
10. 6

Step Z

10-43 Sets

1. 6
2. 4
3. {(5,b) (5,g) (9,b)
(9,g) (6,b) (6,g)}
4. {(b △) (b □) (y, △)
(g, □)}
5. {(△,5) (△,9) (△,6)
(□,5) (□,9) (□,6)}

10-45 Numeral

Across

1. XLV
2. XXXIX
3. XXVI
4. XCIX
5. IX
6. XLIX
7. XV
8. LXXVI
9. CMIX
10. XXX
11. MCCCLV
12. LIV
13. CCXLV
14. M
15. MCL
16. MCC
17. CD
18. C
19. CC
20. MC
21. VI
22. CXIV

Down

1. X
2. XIV
5. IX
8. LXV
9. CCXLIV
11. MCMXL
14. MCCX
17. CMV
18. CI

10-47 Numeral

1. LXXV
2. LXXXVI
3. MCDLXXII
4. CMIV
5. MDCCXXVIII
6. 500 + 100 + 100 + 10 + 7 = 717
7. 1000 + 500 + 100 + 50 = 1650
8. 1000 + 900 + 20 + 4 = 1924
9. 1000 + 500 + 200 + 50 + 20 + 3 = 1773

6-9 may vary

Step Z

10-48 Numeral

1. CCCLXXV
2. MCDXXVI
3. LXXXIX
4. MCMLXXIII
5. DCXXXII
6. 274
7. 97
8. 536
9. 1359
10. 1942

10-50 Addition & Subtraction

1. 4
2. 6
3. 5,2
4. 4,2
5. 9,5
6. 40
7. 8
8. 92
9. 47
10. 6,6
11. 4,0
12. 4,3
13. 1,8
14. 4,4
15. 30
16. 50
17. 3,2
18. 9,4
19. 3,6
20. 43
21. 8,5
22. 0,3
23. 9,9
24. 3,0
25. 99

10-51 Addition & Subtraction

1. 6,6
2. 4,5,7
3. 684
4. 14,1
5. 502
6. 7,2,6
7. 78
8. 169
9. 6,4,3
10. 141
11. 4,6,5
12. 7,3,1
13. 89,7
14. 32,6
15. 1,67
16. 9,1,4
17. 2,3
18. 83
19. 9
20. 6,4
21. 89
22. 538
23. 5,3,5
24. 4,25
25. 467
26. 9,[illegible],5
27. 8,0,3

10-52 Addition & Subtraction

1. $\begin{array}{r} 96 \\ +\ 69 \\ \hline 165 \end{array}$

2. $\begin{array}{r} 5037 \\ +\ 2369 \\ \hline 7406 \end{array}$

3. $\begin{array}{r} 346 \\ +\ 527 \\ \hline 873 \end{array}$

4. $\begin{array}{r} 576 \\ +\ 984 \\ \hline 1560 \end{array}$

5. $\begin{array}{r} 842 \\ +\ \ 95 \\ \hline 937 \end{array}$

6. $\begin{array}{r} 884 \\ -\ 546 \\ \hline 338 \end{array}$

7. $\begin{array}{r} 462 \\ -\ 187 \\ \hline 275 \end{array}$

8. $\begin{array}{r} 846 \\ -\ 457 \\ \hline 389 \end{array}$

9. $\begin{array}{r} 9563 \\ -\ 3894 \\ \hline 5669 \end{array}$

10. $\begin{array}{r} 7436 \\ -\ 2879 \\ \hline 4557 \end{array}$

ANSWER SHEET - Post Test 1

Step A

Sets

1. a = 4
   b = 1
2. x = 9
   z = 1
3. m = 8
   n = 1
4. r = 10
   s = 1
5. c = 3
   d = 1

Numeral

6. D
7. F
8. A
9. B
10. H

Addition

11. $\frac{6}{8}$ or $\frac{3}{4}$
12. $\frac{3}{4}$
13. $\frac{3}{5}$
14. $\frac{2}{3}$
15. $\frac{5}{6}$

Subtraction

16. $\frac{4}{8}$ or $\frac{1}{2}$
17. $\frac{3}{12}$ or $\frac{1}{4}$
18. $\frac{9}{9}$ or 1
19. $\frac{5}{18}$
20. $\frac{5}{10}$ or $\frac{1}{2}$

Step A

Multiplication

21. 5642
22. 5646
23. 2440
24. 8652
25. 54328

Division

26. 57R6
27. 63
28. 65R1
29. 85
30. 327

Geometry

31. yes
32. yes
33. no
34. no
35. yes

Step B

Sets

36. True
37. False
38. True
39. True
40. True

Numeral

41. a
42. c
43. b
44. a
45. b

Step B

Addition & Subtraction

46. +
47. 2/3
48. -
49. 3/5
50. +
51. 3/4
52. -
53. 3/8
54. +
55. 4/5

Multiplication & Division

56. ÷
57. 546 books
58. ÷
59. 96 men
60. X
61. $6055
62. X
63. 848 ft.
64. X
65. 32,400 miles
66. b
67. c
68. a
69. c
70. b

Temperature

71. 14°
72. 58°
73. 46°
74. 72°
75. 31°

Answer Sheet - Post Test II

Level 10

Step A

Sets

1. a = 2
    b = 1
2. c = 6
    d = 1
3. f = 6
    g = 1
4. m = 8
    n = 1
5. k = 12
    l = 1

Numeral

6. G
7. D
8. A
9. C
10. H

Addition

11. 2/3
12. 7/8
13. 5/6
14. 3/4
15. 2/8 or
    1/4

Subtraction

16. 5/9
17. 3/10
18. 3/7
19. 6/12 or
    1/2
20. 1/6

Multiplication

21. 1488
22. 2268
23. 2310
24. 2595
25. 28308

Step A

Division

26. 72
27. 75r4
28. 41
29. 96r1
30. 439

Geometry

31. yes
32. no
33. no
34. yes
35. no

Step B

Sets

36. True
37. False
38. True
39. True
40. True

Numeral

41. b
42. c
43. a
44. b
45. a

Addition & Subtraction

46. -
47. 3/8
48. +
49. 2/5
50. -
51. 3/6
52. +
53. 4/6
54. +
55. 2/4

Step B

Multiplication & Division

56. ÷
57. 331 people
58. X
59. 1800 bu.
60. ÷
61. 45 R5 acres
62. X
63. 50,172 bu.
64. X
65. 4795 feet
66. c
67. a
68. b
69. c
70. b

Temperature

71. 34°
72. 72°
73. 96°
73. 96°
74. 8°
75. 51°

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Level: 11 Step: A Concept: Sets

I. Concept:

Sets: Recognizing the intersection of two sets.

II. Behavioral Objective:

The student given two sets with elements common to each will be able to name the members in the intersection of the sets as a subset or in a Venn diagram.

III. Mathematical Ideas:

A. The intersection of two sets is the set containing all members that are common to both sets.

B. The symbol for intersection is "$\cap$".

C. The set formed by the intersection of two sets is a subset of both of the sets.

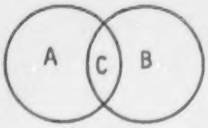
D. A Venn diagram is a picture of two or more sets.

IV. Vocabulary To Stress:

empty set
subset
intersection
Venn diagram
set

V. Activities:

* A. Place two pieces of yarn on the table so they form interlocking circles. Have available many objects such as a pencil, an eraser, a length of string, a book, blocks of differing shapes, and so on. You may then give the students a list of objects in set A and set B and ask them to place each in the appropriate place on the circles. An object common to both sets is placed in the intersection C. Then list the sets. You may vary the sets until you are sure the students understand the concept involved. As they become more proficient they indicate the intersection of the sets without listing individual set members.



Text References:

Book: 4

Houghton Mifflin (1967) pp. 192-193, (53)
Houghton Mifflin (1972) pp. 158-159, (41)

Level: 11 Step: A Concept: Sets

Text References: continued

Book: 5

Houghton Mifflin (1967) pp. 6-7, (2), 168-170
Addison-Wesley (1971, 1968) pp. 166-167, 170-171

Book: 7

Houghton Mifflin (1967) pp. 241-244

* Suggested Introductory Activity

Level: 11 Step: A Concept: Sets

WORKSHEET

Draw Venn diagrams to show the intersection of the sets.

1. Set R = {1, 2, 3, 4}

   Set S = {2, 3, 4, 5, 6}

2. Set L = {5, 10, 15, 20, 25}

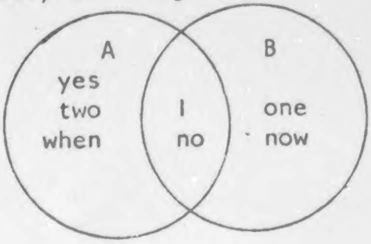
   Set M = {1, 2, 3, 4, 5}

   Set O = {2, 4, 6, 8}

3. Set B = {girls with black hair}

   Set C = {girls with black hair
   and ribbons}

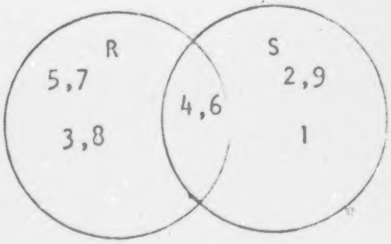
Study the diagrams. List the members of the sets as indicated.


A
yes
two
when
B
I
no
one
now

4. A = {________________________}

   B = {________________________}

   A ∩ B = {________________________}


R
5,7
3,8
4,6
S
2,9
1

5. R = {________________________}

   S = {________________________}

   R ∩ S = {________________________}

Level: 11 Step: A Concept: Numeral

I. Concept:

Numeral: Finding common factors.

II. Behavioral Objectives:

The student given two numerals will be able to list the factors and determine the common factors.

III. Mathematical Ideas:

A. A number that is a factor of two numbers is a common factor of the two numbers.

B. The distributive property states that if we want to add two products with a common factor, we may add the other factors and then multiply the sum of the common factor, or we may rename the factors as products, then name the sum of these products.

$(3 \times 4) + (5 \times 4) = (3 + 5) \times 4 = 8 \times 4 = 32$
$(3 \times 4) + (5 \times 4) = 12 + 20 = 32$

C. The distributive property is based on the idea of common factors so is sometimes known as the common factor property.

D. Common factors are the intersection of two sets.

IV. Vocabulary To Stress:

factor
Venn diagram
common factor property
common factor
distributive property
set
intersection

V. Activities:

* A. Review intersection concepts in Sets, IIA.

B. Use a multiplication chart to find factors, if needed.

C. Let's Play Games in Mathematics Vol. four #30

Text References:

Book: 4

Houghton Mifflin (1967) pp. 199-201, (54)
Houghton Mifflin (1972) pp. 166-167 (43)
Addison-Wesley (1971, 1968) pp. 235-236

Book: 5

Houghton Mifflin (1967) pp. 164-165
Addison-Wesley (1971, 1968) pp. 168-169

Level: 11 Step: A Concept: Numeral

Text References: continued

Book: 6

Houghton Mifflin (1967) pp. 164-167, (37)

Book: 7

Houghton Mifflin (1967) pp. 235-238
Addison-Wesley (1971, 1968) pp. 145, (28)

Other References:

* Modern Mathematics Filmstrip 742: 12-21, 761: 21-31

* Suggested Introductory Activity

11-6

Level: 11 Step: A Concept: Numeral

WORKSHEET: NUMERAL

1. {factors of 36} = {____________________}

   {factors of 12} = {____________________}

   The common factors of 36 and 12 are: {____________________}

2. {factors of 10} = {____________________}

   {factors of 20} = {____________________}

   The common factors of 10 and 20 are: {____________________}

3. {factors of 12} = {____________________}

   {factors of 6 } = {____________________}

   The common factors of 12 and 6 are: {____________________}

4. Use a Venn Diagram to show the common factors of 24 and 36.

   {factors of 24} = {____________________}

   {factors of 36} = {____________________}

Use a Venn Diagram to show the intersection of the following sets.

5. {factors of 15} = {____________________}

   {factors of 30} = {____________________}

6. {factors of 9 } = {____________________}

   {factors of 18} = {____________________}

7. {factors of 3 } = {____________________}

   {factors of 9 } = {____________________}

Level: 11　　　　Step: A　　　　Concept: Addition & Subtraction

I. Concept:

Addition & Subtraction: Adding & subtracting fractional numbers with one fraction having a denominator which is a multiple of the other denominator.

II. Behavioral Objective:

The student given two fractional numbers will be able by renaming one addend to name the sum or missing addend.

III. Mathematical Ideas:

A. To add or subtract fractional numbers they must have the same denominators.

B. To rename a fraction as an equivalent fraction with greater denominator we multiply the numerator and the denominator by the same factor (identity element 1).

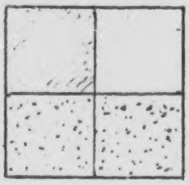
C. To rename a fraction as an equivalent fraction in its simplest form, we divide the numerator and denominator by the greatest common factor.

IV. Vocabulary To Stress:

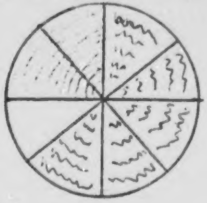
denominator
numerator
factor
addend
sum
equivalent fraction
simplest form

V. Activities:

* A. Draw diagrams such as these to help students complete equations.



$\frac{1}{4} + \frac{1}{2} =$ ______



$\frac{1}{4} + \frac{5}{8} =$ ______

Text References:

Book: 4

Houghton Mifflin (1967) pp. 306-307 (73), 313
Houghton Mifflin (1972) pp. 274

Level: 11 Step: A Concept: Addition & Subtraction

Text References: continued

Book: 5

Houghton Mifflin (1967) pp. 234-236,(59)

Book: 6

Houghton Mifflin (1967) pp. 216, 217

Book: 7

Houghton Mifflin (1967) pp. 341-345
Addison-Wesley (1971, 1968) pp. 45

Other References

* Modern Mathematics Filmstrip 758: 18-22

* Suggested Introductory Activity

Level: 11 Step: A Concept: Addition

WORKSHEET: ADDITION

Name the sum.

1. $\begin{array}{r} \frac{1}{2} \\ + \frac{1}{4} \\ \hline \end{array}$

2. $\begin{array}{r} \frac{1}{3} \\ + \frac{4}{9} \\ \hline \end{array}$

3. $\begin{array}{r} \frac{1}{4} \\ + \frac{4}{12} \\ \hline \end{array}$

4. $\begin{array}{r} \frac{1}{5} \\ + \frac{2}{10} \\ \hline \end{array}$

5. $\begin{array}{r} \frac{1}{6} \\ + \frac{3}{12} \\ \hline \end{array}$

6. $\begin{array}{r} \frac{2}{5} \\ + \frac{1}{10} \\ \hline \end{array}$

7. $\begin{array}{r} \frac{2}{9} \\ + \frac{1}{3} \\ \hline \end{array}$

8. $\begin{array}{r} \frac{3}{6} \\ + \frac{1}{2} \\ \hline \end{array}$

9. $\begin{array}{r} \frac{3}{8} \\ + \frac{1}{2} \\ \hline \end{array}$

10. $\begin{array}{r} \frac{2}{3} \\ + \frac{1}{6} \\ \hline \end{array}$

11. $\begin{array}{r} \frac{1}{2} \\ + \frac{2}{10} \\ \hline \end{array}$

12. $\begin{array}{r} \frac{1}{3} \\ + \frac{3}{12} \\ \hline \end{array}$

13. $\begin{array}{r} \frac{2}{5} \\ + \frac{7}{15} \\ \hline \end{array}$

14. $\begin{array}{r} \frac{3}{4} \\ + \frac{1}{16} \\ \hline \end{array}$

15. $\begin{array}{r} \frac{1}{4} \\ + \frac{1}{8} \\ \hline \end{array}$

16. $\begin{array}{r} \frac{1}{3} \\ + \frac{5}{15} \\ \hline \end{array}$

17. $\begin{array}{r} \frac{3}{4} \\ + \frac{1}{8} \\ \hline \end{array}$

18. $\begin{array}{r} \frac{5}{8} \\ + \frac{1}{16} \\ \hline \end{array}$

19. $\begin{array}{r} \frac{1}{3} \\ + \frac{3}{18} \\ \hline \end{array}$

20. $\begin{array}{r} \frac{2}{6} \\ + \frac{11}{18} \\ \hline \end{array}$

11-10

Level: 11 Step: A Concept: Subtraction

WORKSHEET: SUBTRACTION

Name the difference.

1. $\begin{array}{r}\frac{3}{8}\\ -\frac{1}{4}\\ \hline\end{array}$

2. $\begin{array}{r}\frac{7}{14}\\ -\frac{1}{7}\\ \hline\end{array}$

3. $\begin{array}{r}\frac{3}{6}\\ -\frac{1}{2}\\ \hline\end{array}$

4. $\begin{array}{r}\frac{5}{12}\\ -\frac{1}{6}\\ \hline\end{array}$

5. $\begin{array}{r}\frac{8}{16}\\ -\frac{1}{8}\\ \hline\end{array}$

6. $\begin{array}{r}\frac{5}{12}\\ -\frac{1}{3}\\ \hline\end{array}$

7. $\begin{array}{r}\frac{5}{16}\\ -\frac{1}{4}\\ \hline\end{array}$

8. $\begin{array}{r}\frac{4}{10}\\ -\frac{1}{5}\\ \hline\end{array}$

9. $\begin{array}{r}\frac{7}{9}\\ -\frac{1}{3}\\ \hline\end{array}$

10. $\begin{array}{r}\frac{8}{12}\\ -\frac{1}{4}\\ \hline\end{array}$

11. $\begin{array}{r}\frac{6}{20}\\ -\frac{1}{5}\\ \hline\end{array}$

12. $\begin{array}{r}\frac{4}{6}\\ -\frac{1}{2}\\ \hline\end{array}$

13. $\begin{array}{r}\frac{4}{24}\\ -\frac{1}{8}\\ \hline\end{array}$

14. $\begin{array}{r}\frac{3}{4}\\ -\frac{1}{8}\\ \hline\end{array}$

15. $\begin{array}{r}\frac{5}{10}\\ -\frac{1}{20}\\ \hline\end{array}$

16. $\begin{array}{r}\frac{3}{7}\\ -\frac{2}{14}\\ \hline\end{array}$

17. $\begin{array}{r}\frac{2}{4}\\ -\frac{1}{2}\\ \hline\end{array}$

18. $\begin{array}{r}\frac{3}{6}\\ -\frac{1}{36}\\ \hline\end{array}$

19. $\begin{array}{r}\frac{5}{8}\\ -\frac{1}{4}\\ \hline\end{array}$

20. $\begin{array}{r}\frac{5}{6}\\ -\frac{1}{12}\\ \hline\end{array}$

Level: 11 Step: A Concept: Multiplication

I. Concept:

Multiplication: Multiplying with both factors ten or greater than ten.

II. Behavioral Objective:

The student given 2 two-digit factors will be able to name the product.

III. Mathematical Ideas:

A. The associative property of multiplication means the way the factors are grouped does not affect the product. $3 \times (2 \times 10) = (3 \times 2) \times 10$

B. The commutative property of multiplication means that the order of the factors does not affect the product. $6 \times 20 = 20 \times 6$

C. The distributive (common factor) property of multiplication is used in naming products, i.e. $20 \times 38 = 20 \times (30 + 8) = (20 \times 30) + (20 \times 8)$

D. The expanded equation and 3-step method of multiplication are based on the distributive property.

IV. Vocabulary To Stress:

factor
3 step method
product
number pattern
expanded numerals

V. Activities:

A. Jump the Rope. How to Play: Construct a set of flash cards with multiples of 10.

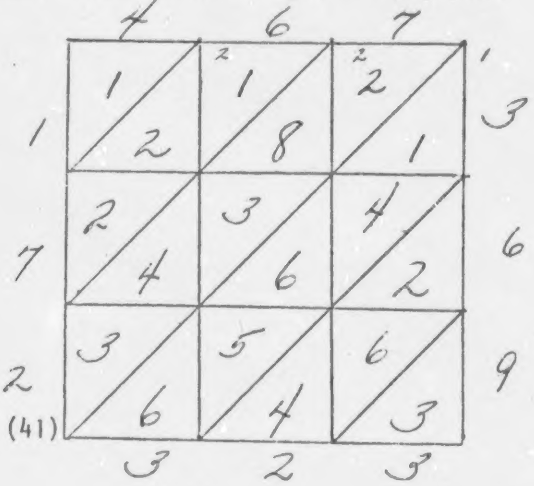
$\boxed{10 \times 20}$ $\boxed{30 \times 40}$

Divide the class into two teams. The two teams are on opposite sides of the rope. The teacher holds up a flash card. The first person on each team will compete against each other. The one who gives the right answer first gets to stay on his side of the rope. The winner can also choose a player from the opposite team to come over and join his team. Each time a team answers last they lose a player. The team with the most members at the end wins.

V. Activities: continued

B. Lattice Maltiplication. In lattice multiplication the vertical form is not used. The places are arranged along diagonal lines. All multiplication is done before any addition takes place. The diagonal columns are added beginning on the bottom right and working left. When the answer for any one diagonal is more than 9, add the number of tens to the next diagonal to the left. In any one box put the tens above the diagonal and the ones below. Read the answer from left to right. 172, 323.

Example: $\begin{array}{r} 467 \\ \times\ 369 \\ \hline \end{array}$



Text References:

Book: 3

Addison-Wesley (1971, 1968) pp. (41)

Book: 4

Houghton Mifflin (1967) pp. 168-169, (44), 170-175, (46), 227-228
Houghton Mifflin (1972) pp. 197-199, (49), 200-203, (50), 204-205, 225-226
Supp. Ex. 348, #11 & 12
Addison-Wesley (1971, 1968) pp. 134-139, (26, 27), Selected parts, 176-178, (37), Supp. Ex. 32

Book: 5

Houghton Mifflin (1967) pp. 32, 110, (31)
Addison-Wesley (1971, 1968) pp. 50-53, (12), 55, 114-115, (25)

Book: 6

Houghton Mifflin (1967) pp. 45, (9)
Houghton Mifflin (1972) pp. 63, Extra Practice p. 339
Addison-Wesley (1971, 1968) pp. 46-49, (10, 11)

Book: 7

Houghton Mifflin (1967) pp. 153-154
Addison-Wesley (1971, 1968) pp. 109-111

Other References:

* Imperial Tapes (Intermediate) Lesson 10.

* Modern Mathematics Filmstrip 740: 1-16, 741: 14-33, 760: 11-14

* Suggested Introductory Activity

Level: 11 Step: A Concept: Division

I. Concept:

Division: Dividing a 3 digit product by a 2 digit factor.

II. Behavioral Objective:

The student given a 3 digit product (dividend) and a 2 digit factor (divisor) will be able to name the missing factor (quotient).

III. Mathematical Ideas:

A. Division may be thought of as the process of determining the number of times the divisor may be subtracted from the dividend in succession.

B. Another word for missing factor is quotient.

C. The number from which a factor or its multiples is subtracted may be called the dividend.

D. The factor whose multiples are subtracted in succession from the dividend may be called the divisor.

E. Division may be related to an equation like 378 - (14 x 27) = 0. The divisor is 27, the dividend is 378, the quotient is 14, and the remainder is 0. The equation says that 27 may be subtracted from 378 a total of 14 successive times and leave no remainder.

V. Activities:

A. Have students show a given problem 3 ways:

$$567 - (17 \times 33) = 6 \text{ or } 17\overline{)\begin{array}{r|l} 567 & \\ 510 & 30 \\ \hline 57 & \\ 51 & 3 \\ \hline 6 & 33 \end{array}} \quad \text{or} \quad 33\overline{)\begin{array}{r|r} 567 & \\ 330 & 10 \\ \hline 237 & \\ 231 & 7 \\ \hline 6 & 17 \end{array}}$$

B. Let's Play Games in Mathematics Vol. four #41

Text References:

Book: 4

Houghton Mifflin (1967) pp. 250-251, 252, #1-18
Houghton Mifflin (1972) pp. 248, (62), 249, #1-18, Supp. Ex. 352

Level: 11 Step: A Concept: Division

Text References: continued

Book: 5

Houghton Mifflin (1967) pp. 126
Houghton Mifflin (1972) pp. 181, 343, #1-3

Book: 6

Houghton Mifflin (1972) pp. 60-62

Other References:

* Modern Mathematics Filmstrips 744: 20-38

* Suggested Introductory Activity

Level: 11 Step: A Concept: Functions & Graphs

I. Concept:

Function & Graphs: Representing data on a linear or bar graph.

II. Behavioral Objective:

The student given the data will be able to complete a linear or bar graph or read the data from a given linear or bar graph.

III. Mathematical Ideas:

A. Numerical information may be called data.

B. A picture used to show data is called a graph.

C. Data may be graphed on a number plane.

D. Data may be represented by bar graphs. The height of a particular column indicates the numerical information about the item named on the horizontal axis.

E. Bar graph data may be treated as a set of ordered pairs.

F. Bar graphs are used with finite data - each item is independent of the other items.

IV. Vocabulary To Stress:

data
bar graph
graph
linear

V. Activities:

It is important that children actually construct graphs.

* A. Suggestions for construction of graphs in the classroom. Graphs, Arithmetic Teacher, October 1970, pp. 499-501.
1. Attendance graph. (Use blocks to construct.)
2. Ways of coming to school. (Use colored beads on a dowel or an abacus to construct.)
3. Number of birthdays in a month. (Use gummed stickers to construct.)
4. Height of plants. (Use oaktag to represent actual height of the plants.)
5. Converting a record or tally to a graph.

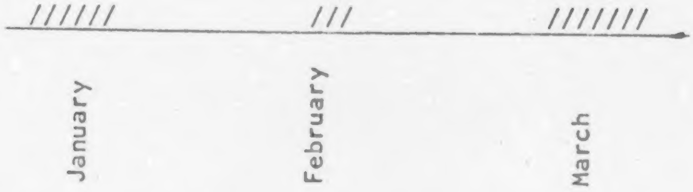
In graph 3, the gummed stickers could be multi-colored, each color representing a different month. Before making graph 5 a tally must be made and then rotated. Example: Birthdays in each month.

V. Activities: continued

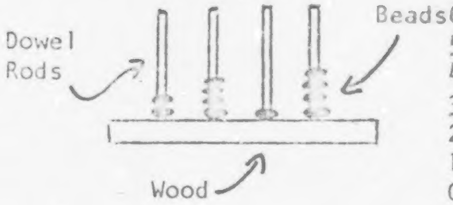
A. continued

January: //////
Februaty: ///
March: ///////

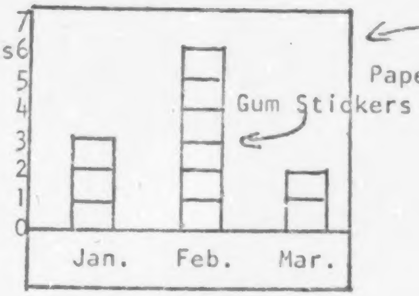
Now ratate the tally.



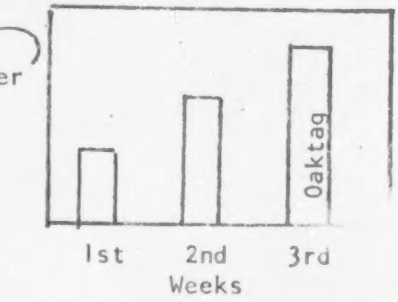
Graph 2



Graph 3



Graph 4



B. Suggested topics for graph construction. Have children do both linear and bar graphs.

1. Favorite television programs.
2. Size of families.
3. Time spent in different activities.
4. Temperatures.
5. Number of hours you and 5 friends watch TV weekly.
6. Number of children in each grade.
7. Shoe sizes of boys, girls.
8. Throw a pair of dice a certain number of times (100 or 200) and record the results.
9. Science data.

Level: 11 Step: A Concept: Functions & Graphs

Text References:

Book: 4

Houghton Mifflin (1967) pp. 274-279, (68)
Houghton Mifflin (1972) pp. 121, 308-311
Addison-Wesley (1971, 1968) pp. 175, 246-249

Book: 5

Houghton Mifflin (1967) pp. 88-89, 91-93, (25)
Houghton Mifflin (1972) pp. 21, 312, 313 (75)
Addison-Wesley (1971, 1968) pp. 304-305, (54, 55, 56)

Book: 6

Houghton Mifflin (1967) pp. 146-147
Houghton Mifflin (1972) pp. 72

Book: 7

Houghton Mifflin (1967) pp. 484-489
Addison-Wesley (1971, 1968) pp. 354-355, (74)

Other References:

Imperial Tapes (Intermediate)Lesson 39. Includes averages, bar and circle graphs, and tables.

* Suggested Introductory Activity

11-18

Level: II　　Step: A　　Concept: Geometry

I. Concept:

Geometry: Identifying planes and their properties.

II. Behavioral Objective:

The student given a picture showing properties of planes will be able to correctly identify the properties of a plane.

III. Mathematical Ideas:

A. A plane may be described as a set of points in a "flat surface" which extends indefinitely in all directions.

B. 3 points, not on a line, determine only one plane.

C. The intersection of two planes is a line. Many planes can be drawn through one line.

D. Two planes that do not intersect are parallel.

E. The intersection of 3 planes may be a line or a point.

IV. Vocabulary To Stress:

plane
line
properties
parallel
point
intersection
angle

V. Activities:

* A. Use objects in the room that are planes. Have the children try and discover their properties. Identify intersection of planes at corner of room as line and point. Floor and ceiling are parallel planes. It is important to use observation skills to identify properties and discriminate between them.

B. Have children draw examples of intersecting and parallel planes.

Text References:

Book: 4

Houghton Mifflin (1967) pp. 256-259, (64)
Houghton Mifflin (1972) pp. 106, 116, 290-291

Level: 11 Step: A Concept: Geometry

Text References: continued

Book: 5

Houghton Mifflin (1967) pp. 64, 66-67 (19)
Houghton Mifflin (1972) pp. 102-103

Book: 6

Houghton Mifflin (1967) pp. 86-87

Book: 7

Houghton Mifflin (1967) pp. 186-190, (29)
Addison-Wesley (1971, 1968) pp. 74-77

* Suggested Introductory Activity

Level: II Step: A Concept: Measurement

I. Concept:

Measurement: Using a set of data to find average and range.

II. Behavioral Objective:

The student given a set of data will be able to find the average and range.

III. Mathematical Ideas:

A. The average of a set of numbers is determined by naming the sum of the numbers in the set and dividing the sum by the cardinal number of the set.

B. An average is a number which is used as a single representative for a set of data.

C. The average is the number each member of the data would be if all members were the same.

D. The range of a set of data indicates the spread of data between the greatest and least members of the set of data.

IV. Vocabulary To Stress:

data average range

V. Activities:

* A. Have the class collect data of many kinds about a week before teaching average and range. The data can vary. The children can research grades, temperatures, absences, lunces, etc. The data collected can be selected according to the interest of the class. This data can be used in teaching average and range.

Text References:

Book: 4

Houghton Mifflin (1967) pp. 280-281, (69), 282-283
Houghton Mifflin (1972) pp. 306-308, (75)
Addison-Wesley (1971, 1968) pp. 212-213, (45), Supp. Ex. 36

Book: 5

Houghton Mifflin (1967) pp. 156-159, (41), 284-285
Addison-Wesley (1971, 1968) pp. 126-127

Book: 6

Houghton Mifflin (1967) pp. 118-119
Addison-Wesley (1971, 1968) pp. 62-63, 74, 193

Level: 11 Step: A Concept: Measurement

Text References: continued

Book: 7

Houghton Mifflin (1967) pp. 492-494
Addison-Wesley (1971, 1968) pp. 118, (19), 119

Other References:

Imperial Tapes (Intermediate) Lesson 39, includes Average, graphs, and tables.

* Suggested Introductory Activity

Level: 11 Step: A Concept: Measurement

WORKSHEET: Averages

Find the averages and ranges. Show your work for each problem.

1. Mr. Gray has 4 calves. They weigh 174, 214, 220, and 304 pounds. The average weight of the calves is __________ pounds. The range in weight was __________.

2. Mr. Green drove his car for 5 hours. He drove 40 miles the first hour, 45 miles the second hour, 35 miles the third hour, 40 miles the fourth hour, 40 miles the fifth hour. Mr. Green averaged __________ miles per hour. What is the range of distances Mr. Green drove? __________

3. Joe earned $1.50 on Monday, $.65 on Tuesday, $1.65 on Wednesday, $.70 on Thursday, and $.50 on Friday. How much money did he average per day? __________. What is the range of Joe's earnings? __________

4. Jim is 12 years old; Vernon is 13 years old; and David is 11 years old. The average age of the boys is __________ years. What is the range of their ages? __________.

5. John is 60 inches tall; Jim is 56 inches tall; Joe is 54 inches tall; Jerry is 55 inches tall; Jimmy is 50 inches tall. What is their average height? __________. What is the range of the boys' height? __________

Level: 11 Step: B Concept: Sets

I. Concept:

Sets: Naming finite and infinite sets.

II. Behavioral Objective:

The student given a variety of sets will be able to name those which are finite and those which are infinite.

III. Mathematical Ideas:

A. Any nonempty set whose elements can be place in one-to-one correspondence with those of a standard set is said to be a finite set.

B. A nonempty set whose members cannot be counted or listed is called an infinite set.

C. Finite sets have a cardinal number.

D. Infinite sets do not have a cardinal number.

E. If one or more elements of a set S are removed and still match S one-to-one with the resulting subset, we say that S is an infinite set.

$S = (0, 1, 2, 3, \ldots)$

$T = (1, 2, 3, 4, \ldots)$ Each member in S can be matched with $(x + 1)$ in T.

F. If some of the elements from any one of the finite sets are removed, a set which is smaller than the original set will result and the cardinal numbers of the sets can be compared. i.e., Removing half the stars in the sky will leave fewer stars.

IV. Vocabulary To Stress:

finite
infinite
sets

whole number
cardinal number

counted
listed

V. Activities:

* A. Counting children, books, other tangible objects -- finite.

* B. See how many lines can be drawn through a given point -- infinite.

* C. See how many different shapes can be drawn -- infinite.

* D. Show that the set of all even whole numbers is infinite. Show how to pair this set, one-to-one, with the set of whole numbers.

$M = (2, 4, 6, 8, \ldots)$

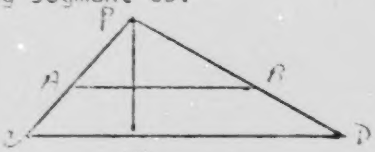
$P = (1, 2, 3, 4, \ldots)$

V. Activities: continued

* E. Consider the set S = (5, 10, 15, ...) where the elements are all multiples of 5. Show that S is infinite.

* F. Explain why the set of all people over five feet tall is not an infinite set.

* G. Explain how there are as many points in the short segment AB as in the long segment CD.



(Any line drawn from $\overline{CD}$ to P must pass through $\overline{AB}$, hence there are as many points on $\overline{AB}$ as on $\overline{CD}$.)

Text References:

Book: 3

Houghton Mifflin (1967) pp. 222-223

Book: 4

Houghton Mifflin (1967) pp. 5, 7
Houghton Mifflin (1972) pp. 157

Book: 5

Houghton Mifflin (1967) pp. 1-5, (1), 9

Book: 6

Houghton Mifflin (1967) pp.1-5, (1), 13

Book: 7

Houghton Mifflin (1967) pp. 20

* Suggested Introductory Activity

Level: 11 Step: B Concept: Numeral

I. Concept:

Numeral: Recognizing prime and composite numbers.

II. Behavioral Objective:

The student given a number 100 or less will be able to determine if it is a prime number or a composite number.

III. Mathematical Ideas:

A. Any whole number greater than 1 which has only two factors (itself and 1) is called a prime number.

B. Any prime number greater than 2 cannot be even, because every even number greater than 2 has at least three factors.

C. The number 1 is not a prime as it has only itself as a factor.

D. A composite number is a whole number greater than one which has three or more factors. Those numbers which are not called prime, are called composite.

E. Any number greater than 2 may be expressed as the sum of 2 primes (Goldback Conjecture).

F. Any number which is both a prime and a factor is a prime factor.

IV. Vocabulary To Stress:

factor	primes	composite number
multiple	prime number	prime factor

V. Activities:

* A. "Prime Drag", is a very interesting game for learning the concept of "prime" and "composite" numbers.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 232-233, (60)
Addison-Wesley (1971, 1968) pp. 204-205

Book: 4

Houghton Mifflin (1967) pp. 202-203, (55)
Houghton Mifflin (1972) pp. 168-169, (44)
Addison-Wesley (1971, 1968) pp. 238-241

Level: 11 Step: B Concept: Numeral

Text References: continued

Book: 5

Houghton Mifflin (1967) pp. 172-173, (44), 174-175, (45), 176-178
Houghton Mifflin (1972) pp. 166-167
Addison-Wesley (1971, 1968) pp. 162-165

Book: 6

Houghton Mifflin (1967) pp. 168-170
Addison-Wesley (1971, 1968) pp. 84-85

Book: 7

Houghton Mifflin (1967) pp. 231-235, (33)
Addison-Wesley (1971, 1968) pp. 142-144, (26, 27)

Other References:

Imperial Tapes (Intermediate) Lesson 15

* Modern Mathematics Filmstrips 742: 7-11, 751: 14-22, 27-28

* Suggested Introductory Activity

Level: 11 Step: B Concept: Order

I. Concept:

Order: Finding the solution set for a number sentence.

II. Behavioral Objective:

The student given a number sentence will be able to name the solution set.

III. Mathematical Ideas:

A. English sentences use words; mathematical or number sentences use symbols.

B. An open sentence is neither true nor false.

C. A closed sentence may be true or false.

D. The solution set makes the sentence true.

E. An inequality may have more than one solution.

IV. Vocabulary To Stress:

solution
number sentence
replacement set
solution set
inequality
open sentence
closed sentence

V. Activities:

A. Have the children play the roles of detectives. Make up a crime and have the children offer many solutions. Show them that only one correct solution will lead them to the culprit; as there is only one correct solution for each number set; ie. make a bulletin board with a masked bandit holding a set $\{m > 5\}$. Use strings to lead to the one correct solution. Rind the correct solution with handcuffs. Change the set and solutions frequently.

* B. Give students felt numerals in one pile, operation signs in another, and relation symbols in a third. Have them use at least two numerals and one symbol from each pile to create different closed number sentences. You might then give students a fourth pile of felt letters. Let them use the four piles to create open sentences. Help them to see that the open sentences have one thing that closed sentences do not - an unknown quantity.

Level: II Step: B Concept: Order

Text References:

Book: 4

Houghton Mifflin (1967) pp. 32-34, (8), 35
Houghton Mifflin (1972) pp. 10-14

Book: 5

Houghton Mifflin (1967) pp. 11

Book: 6

Houghton Mifflin (1967) pp. 130-131, 330-331

Book: 7

Houghton Mifflin (1967) pp. 42-43, 48, 74, 79-80, 88-89, 92
Addison-Wesley (1971, 1968) pp. 36, (6), 37-41, 55, 114-115

Book: 8

Addison-Wesley (1971, 1968) pp. 56

* Suggested Introductory Activity

Level: 11 Step: B Concept: Order

WORKSHEET: ORDER

Write the set of solutions for each inequality. The universal set for each inequality is the set of whole numbers:

$\{0, 1, 2, 3, 4, \ldots\}$

1. $n < 5$ { }

2. $n > 10$ { }

3. $n < 12$ { }

4. $n > 37$ { }

5. $n > 23$ { }

6. $n > 2$ and $n < 12$ { }

7. $n > 5$ and $n < 17$ { }

8. $n > 7$ and $n < 9$ { }

9. $n > 6$ and $n < 16$ { }

For each inequality choose the correct set of solutions from Column II.

Column I		Column II
10. $n > 3$ and $n < 9$	________	$A = \{18, 19, 20, 21, 22, 23\}$
11. $n < 24$ and $n > 17$	________	$B = \{7\}$
12. $n > 6$ and $n < 8$	________	$C = \{4, 5, 6, 7, 8\}$

Level: 11 Step: B Concept: Multiplication & Division

I. Concept:

Multiplication & Division: Solving word problems using multiplication involving two 2-digit factors or division involving 3-digit product (dividend) and 2-digit factor (divisor).

II. Bheavioral Objective:

The student given word problems using multiplication involving two 2-digit factors or division involving 3-digit product (dividend) and 2-digit factor (divisor) will be able to solve the problem.

III. Mathematical Ideas:

A. Mathematical thinking involves identifying the sets and distinguishing between joining and separating the sets.

IV. Vocabulary To Stress

dividend
factors
divisor
product
quotient

Text References:

Book: 4

Houghton Mifflin (1967) pp. 175, 253 (parts)
Houghton Mifflin (1972) pp. 199, 203 (parts)
Addison-Wesley (1971, 1968) pp. (53) 181

Book: 5

Addison-Wesley (1971, 1968) pp. 139

Book: 6

Houghton Mifflin (1967) pp. 63 (15)

Level: 11 Step: B Concept: Multiplication & Division

Determine the operation and solve each problem. Show your work.

1. There are 56 pounds of shelled corn in a bushel. Mr. Johns has 43 bushels of shelled corn. How many pounds of shelled corn has he?

2. Karen's mother pays her $.56 a week for washing the dishes. How much will she earn in 7 weeks?

3. There are 24 hours in each day. How many days are in 744 hours?

4. There are 12 objects in one dozen. How many dozen are in 300 objects?

5. There are 16 ounces in one pound. How many pounds are in 608 ounces?

6. Janet paid $.79 each for 14 new piano pieces. Her music cost ____________________.

7. Mr. Brown raised 17 acres of wheat. He got 39 bushels per acre. Mr. Brown raised ____________ bushels of wheat.

8. If the 69 children in the two fourth grades are making 828 name cards for Parents' Night, how many cards must each child make?

Level: 11 Step B Concept: Multiplication & Division

Determine the operation and solve each problem. Show your work.

1. There are 36 inches in one yard. How many yards are in 612 inches?

2. On our trip we traveled 660 miles. If we averaged 55 miles per hour, how many hours did it take us?

3. Mr. Kelly bought 23 acres of land at $83 an acre. He paid ______________ for the land.

4. If you travel to and from school 14 miles each day, how many days will it take to travel 588 miles?

5. Mr. Morrow bought 8 tons of coal. He paid $23.50 a ton. How much was his bill?

6. Mr. Carlson earns $18 a day. He worked 23 days last month. He earned ______________ last month.

7. There are 12 inches in one foot. How many feet are there is 324 inches?

8. It took 456 squares of tile to cover 38 square feet. How many squares of tile are in each square foot?

Level: 11 Step: B Concept: Function

I. Concept:

Function: Using an equation to determine the second number of an ordered pair.

II. Behavioral Objective:

The student given an equation and one member of a set of ordered pairs will be able to name the second member of the set of ordered pairs.

III. Mathematical Ideas:

A. A function is a set of ordered pairs and its rule.

B. A function rule may be stated as an equation.

C. If the first member of the pair is given, the rule tells how to find the second member of the pair.

D. If m stands for the first member of any pair and n for the second member of the pair, then any number pair can be written (m, n) and an equation for a function rule can be shown: $m + 5 = n$

IV. Vocabulary To Stress:

function
replacement set
equation
ordered pair
rule

Text References:

Book: 4

Houghton Mifflin (1967) pp. 177, 238-239
Houghton Mifflin (1972) pp. 228-229, (57)

Book: 5

Houghton Mifflin (1967) pp. 38-39, (10), 42, (11), 44, 138-141, (40), 318
Addison-Wesley (1971, 1968) pp. 18-23, 26, 28-32, 45.

Book: 6

Houghton Mifflin (1967) pp. 95, 107, 144
Houghton Mifflin (1972) pp. 31, 232
Addison-Wesley (1971, 1968) pp. 306-307

Level: 11 Step: B Concept: Function

WORKSHEET

Use the rule to complete the number pairs in each set.

1. m + 26 = n (27, ___) (59, ___) (18, ___) (83, ___) (146, ___)
2. m x 7 = n (84, ___) (10, ___) (15, ___) (143, ___) (35, ___)
3. m - 36 = n (59, ___) (103, ___) (95, ___) (120, ___) (89, ___)
4. m x 100 = n (36, ___) (10, ___) (59, ___) (13, ___) (22, ___) (104, ___)
5. (m ÷ 8) = n (64, ___) (328, ___) (416, ___) (80, ___) (264, ___)

Use the rule 6 x t = n to complete the chart:

t	10	5	b	19	35	e	43	30	h	i	75	k
n	60	a	96	c	d	600	f	g	72	18	j	66

Use the rule to write each function as a set of ordered pairs. The numbers in the set given are the first members of each pair and the replacement for t.

6. t + 16 = u {3, 7, 25, 34, 75, 18}
7. t - 46 = u {81, 95, 100, 51, 74, 256}
8. t x 10 = u {37, 12, 26, 97, 11, 25}
9. t - 3 = u {15, 45, 18, 300, 48, 21}
10. t - 35 = u {84, 96, 112, 79, 207, 310}

Write equations for the following sets of ordered pairs using m for the first number and n for the second member of the pair.

11. {(6,12) (4,8) (7,14) (9,18) (12,24) (25,50)} ____________
12. {(5,11) (9,15) (10,16) (3,9) (8,14) (1,7)} ____________
13. {(12,7) (15,10) (9,4) (25,20) (18,13) (8,3)} ____________
14. {(8,2) (20,5) (36,9) (40,10) (4,1) (28,7)} ____________
15. {(8,20) (5,17) (10,22) (3,15) (7,19) (20,32)} ____________

Level: 11 Step: B Concept: Measurement

I. Concept:

Measurement: Weight - changing ounces to pounds, pounds to tons, and their reversals.

II. Behavioral Objective:

The student given the weight in pounds or ounces will be able to determine the equivalent in ounces or pounds and given the weight in tons or pounds will be able to determine the equivalent in pounds or tons.

III. Mathematical Ideas:

A. The sumbol "lb." stands for pound.

B. The symbol "oz." stands for ounce.

C. The symbol "T." stands for ton.

D. Sixteen ounces are equivalent to one pound.

E. Two thousand pounds are equivalent to one ton.

IV. Vocabulary To Stress:

ounce pound ton

V. Activities:

* A. Bring in as many types of scales as are available. Weigh anything feasible in the classroom. Make up problems using these weights.

Text References:

Book: 4

Addison-Wesley (1971, 1968) pp. 287

Other References:

Learning about Measurement, Franklin Series, pp. 69-71.

* Suggested Introductory Activity

Level: 11 Step: B Concept: Measurement

WORKSHEET

Find the equivalent weights. Show your work.

1. 7 lb. = __________ oz.

2. 48 oz. = __________ lb.

3. 8 ton = __________ lb.

4. 5 ton = __________ lb.

5. 672 oz. = __________ lb.

6. 18 lb. = __________ oz.

7. 54 lb. = __________ oz.

8. 8000 lb. = __________ T.

9. __________ lb. = 656 oz.

10. 9 ton = __________ lb.

11. __________ oz. = 23 lb.

12. __________ lb. = 544 oz.

13. 14 ton = __________ lb.

14. 5 lb. 6 oz. = __________ oz.

15. 2 ton 500 lb. = __________ lb.

16. 7 ton = __________ lb.

17. 8 lb. 10 oz. = __________ oz.

18. 112 oz. = __________ lb.

19. 29 lb. = __________ oz.

20. 64 oz. = __________ lb.

Level: 11 Step: B Concept: Measurement

WORKSHEET

Solve these problems. Show your work.

1. Jane bought 3 pounds of chocolate candy. How many ounces of candy did she buy?

____

2. A head of cabbage weighed 4 pounds. How many ounces did it weigh?

____

3. If a bunch of grapes weighed 3 lb. 4 oz., how many ounces in all did it weigh?

____

4. Mr. Davis has a truck that weighs 22,000 lbs. How many tons does it weigh?

____

5. Jim's baby brother weighed 112 oz. when he was born. How many pounds did he weigh?

____

6. The sign on the bridge said, "Maximum weight 8 tons." How many pounds will this bridge hold?

____

7. A gallon can of beans weighs 6 lbs. How many ounces is this?

____

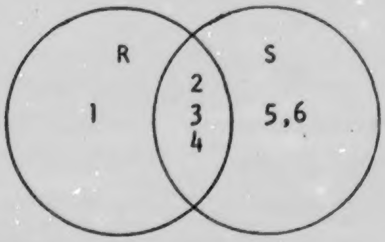
8. John wanted to buy 8 lbs. of candy. So far the clerk has weighed up 6 lbs. 5 oz. How many more ounces will have to weighed up?

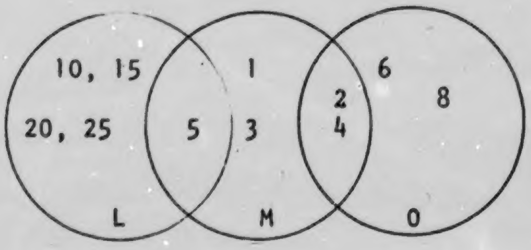
____

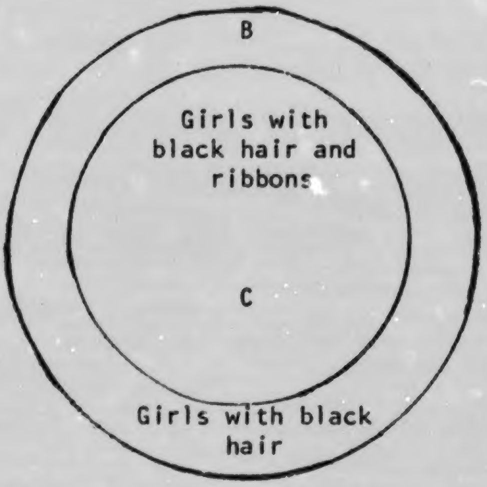
Level: 11

ANSWERS TO WORKSHEETS

11-3




10, 15
20, 25
5
1
3
2
4
6
8
L
M
O


B
Girls with black hair and ribbons
C
Girls with black hair

4. A = {yes, two, when, I, no}
B = {I, no, one, now}
A ∩ B = {I, no}

5. R = {5, 7, 3, 8, 4, 6}
S = {4, 6, 2, 9, 1}
R ∩ S = {4, 6}

11-6

1. 36 = {1, 2, 3, 4, 6, 9, 12, 18, 36}
12 = {1, 2, 3, 4, 6, 12}
common {1, 2, 3, 4, 6, 12}

2. 10 ={1, 2, 5, 10}
20 ={1. 2, 4, 5, 10, 20}
common {1, 2, 5, 10}

3. 12 = {1, 2, 3, 4, 6, 12}
6 = {1, 2, 3, 6}
common {1, 2, 3, 6 }

4. 24 = {1, 2, 3, 4, 6, 8, 12, 24}
36 = {1, 2, 3, 4, 6, 9, 12, 18, 36}
common {1, 2, 3, 4, 6, 12}

5. 15 = {1, 3, 5, 15}
30 = {1, 2, 3, 5, 6, 10, 15, 30}
common {1, 3, 5, 15}

6. 9 = {1, 3, 9}
18 = {1, 2, 3, 6, 9, 18}
common {1, 3, 9}

7. 3 = {1, 3}
9 = {1, 3, 9}
common {1, 3}

Level: 11 ANSWERS TO WORKSHEETS CONTINUED

11-9

1. $\frac{3}{4}$
2. $\frac{7}{9}$
3. $\frac{7}{12}$
4. $\frac{4}{10}$ or $\frac{2}{5}$
5. $\frac{5}{12}$
6. $\frac{5}{10}$ or $\frac{1}{2}$
7. $\frac{5}{9}$
8. $\frac{6}{6} = 1$
9. $\frac{7}{8}$
10. $\frac{5}{6}$
11. $\frac{7}{10}$
12. $\frac{7}{12}$
13. $\frac{13}{15}$
14. $\frac{13}{16}$
15. $\frac{3}{8}$
16. $\frac{10}{15}$ or $\frac{2}{3}$
17. $\frac{7}{8}$
18. $\frac{11}{16}$
19. $\frac{9}{18}$ or $\frac{1}{2}$
20. $\frac{17}{18}$

11-10

1. $\frac{1}{8}$
2. $\frac{5}{14}$
3. $\frac{0}{6}$
4. $\frac{3}{12} = \frac{1}{4}$
5. $\frac{6}{16} = \frac{3}{8}$
6. $\frac{1}{12}$
7. $\frac{1}{16}$
8. $\frac{2}{10} = \frac{1}{5}$
9. $\frac{4}{9}$
10. $\frac{5}{12}$
11. $\frac{2}{20} = \frac{1}{10}$
12. $\frac{1}{6}$
13. $\frac{1}{24}$
14. $\frac{5}{8}$
15. $\frac{9}{20}$
16. $\frac{4}{14} = \frac{2}{7}$
17. $\frac{0}{4}$
18. $\frac{17}{36}$
19. $\frac{3}{8}$
20. $\frac{9}{12} = \frac{3}{4}$

11-22

1. 228, 130
2. 40, 10
3. $100, 115
4. 12, 2
5. 55, 10

Level: 11 ANSWERS TO WORKSHEETS CONTINUED

11-29

1. {0, 1, 2, 3, 4 }
2. {11, 12, 13,...}
3. {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}
4. {38, 39, 40, ...}
5. {24, 25, 26, ...}
6. {3, 4, 5, 6, 7, 8, 9, 10, 11}
7. {6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16}
8. {8}
9. {7, 8, 9, 10, 11, 12, 13, 14, 15}
10. C
11. A
12. B

11-31

1. 2408 lbs.
2. $3.92
3. 31 days
4. 25 doz.
5. 38 lb.
6. $11.06
7. 663 bushels
8. 12 cards

11-32

1. 17 yd.
2. 12 hr.
3. $19.09
4. 42 days
5. $188.00
6. $414
7. 27 ft.
8. 12

11-34

1. 53, 85, 44, 109, 172
2. 588, 70, 105, 1001, 245
3. 23, 67, 59, 84, 53
4. 3600, 1000, 5900, 1300, 2200, 10400
5. 8, 41, 52, 10, 33
    - a. 30
    - b. 16
    - c. 114
    - d. 210
    - e. 100
    - f. 258
    - g. 180
    - h. 12
    - i. 3
    - j. 450
    - k. 11
6. {(3,19) (7,23) (25,41) (34,50) (75,91) (18,34)}
7. {(81,35) (95,49) (100,54) (51,5) (74,28) (256,210)}
8. {(37,370) (12, 120) (26, 260) (97, 970) (11, 110) (25,250)}
9. {(15,12) (45,42) (18,15) (300,297) (48,45) (21,18)}
10. {(84,49) (96,61) (112,77) (79,44) (207,172) (310,275)}
11. $m \times 2 = n$
12. $m + 6 = n$
13. $m - 5 = n$
14. $m \div 4 = n$
15. $m + 12 = n$

Level: 11 ANSWERS TO WORKSHEETS CONTINUED

11-36

1. 112
2. 3
3. 16,000
4. 10,000
5. 42
6. 288
7. 864
8. 4
9. 41
10. 18,000
11. 368
12. 34
13. 28,000
14. 86
15. 4,500
16. 14,000
17. 138
18. 7
19. 464
20. 4

11-37

1. 48
2. 64
3. 52
4. 11
5. 7
6. 16,000
7. 96
8. 27

Level: 11

Answer Sheet - Post Test I

Step A

Sets

1. b
2. d
3. a
4. c
5. b

Numeral

6. 1, 6, 18, 2, 3, 9
7. 1, 2, 3, 6
8. 1, 2, 4, 5, 8, 10, 20, 40
9. 1, 2, 4
10. 1

Addition & Subtraction

11. $\frac{7}{8}$
12. $\frac{4}{20}$
13. $\frac{11}{24}$
14. $\frac{9}{16}$
15. $\frac{9}{14}$
16. $\frac{1}{4}$
17. $\frac{1}{6}$
18. $\frac{5}{14}$
19. $\frac{5}{12}$
20. $\frac{3}{8}$

Multiplication

21. 3,680
22. 2,920
23. 2,064
24. 2,124
25. 1,736

Division

26. 18
27. 24
28. 42
29. 18
30. 24

Functions & Graphs

Check graph

Geometry

36. d
37. b
38. a
39. c
40. a

Measurement

41. 4
42. 2-7
43. 89
44. 79-100
45. 29
46. 26-31
47. 37
48. 24-48
49. 20
50. 10-35

Step B

Sets

51. a
52. b
53. a
54. a
55. b

Numeral

56. a
57. a
58. b
59. b
60. a

Order

61. {0, 1, 2, 3, 4, 5, 6, 7}
62. {16, 17, 18, ...}
63. {41, 42, 43, ...}
64. {3, 4, 5, 6}
65. {20, 21, 22, 23, 24}

MULTIPLICATION & DIVISI

66. 4
68. 60
70. 23
72. 18
74. 384

Functions

76. 6, 12, 9, 8
77. 7, 0, 3, 9
78. 10, 18, 8, 14
79. 5, 9, 4, 2
80. 11, 15, 9, 13

Measurement

81. 4
82. 128
83. 320
84. 9
85. 50
86. 6,000
87. 18,000
88. 4
89. 14,000
90. 6

Level: 11

Answer Sheet - Post Test II

Step: A

Sets

1. c
2. b
3. a
4. b
5. d

Numeral

6. 1, 2, 3, 6
7. 1
8. 1, 2
9. 1, 2, 4, 8, 16
10. 1, 2, 3, 4, 6, 12

Addition & Subtraction

11. $\frac{5}{6}$
12. $\frac{7}{36}$
13. $\frac{22}{24}$
14. $\frac{12}{16}$
15. $\frac{6}{27}$
16. $\frac{8}{12}$
17. $\frac{2}{6}$
18. $\frac{7}{16}$
19. $\frac{2}{9}$
20. $\frac{3}{10}$

Multiplication

21. 4,550
22. 1,900
23. 2,944
24. 3,285
25. 1,044

Division

26. 34
27. 41
28. 28
29. 21
30. 27

Functions & Graphs

Check graph

Geometry

36. a
37. d
38, b
39. d
40. c

Measurement

41. 78
42. 14
43. 53
44. 7
45. 58
46. 6
47. 56
48. 8
49. 57
50. 10

Step: B

Sets

51. a
52. b
53. b
54. a
55. a

Numeral

56. a
57. b
58. a
59. b
60. b

Order

61. {15, 16, 17,...}
62. {0, 1, 2, 3, 4, 5, 6}
63. {0, 1, 2}
64. {6, 7, 8, 9, 10, 11, 12, 13, 14}
65. {39, 40, 41, 42, 43, 44, 45, 46, 47}

Multiplication & Division

66. 46
68. 864
70. 360
72. 12
74. 798

Functions

76. 15, 10, 12, 16
77. 7, 4, 5, 8
78. 12, 21, 6, 15
79. 7, 10, 5, 13
80. 14, 19, 7, 13

Measurement

81. 16,000
82. 64
83. 3
84. 2
85. 10,000
86. 128
87. 5
88. 18,000
89. 6
90. 80

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Level: 12 Step: A Concept: Sets

I. Concept:

Sets: Negating simple declarative statements.

II. Behavioral Objective:

The student given a set diagram will be able to determine whether statements with "all", "some", or "none" are true or false.

III. Mathematical Ideas:

A. A simple declarative sentence may be contradicted.

B. A closed mathematical sentence is either true or false.

C. An open mathematical sentence is one that cannot be said to be either true or false.

D. A sentence with the symbol " ≠ " implies that the relationship is either greater than or less than.

E. To disagree with an all statement, we must make a some-not statement.

F. To disagree with a no statement, we must make a some or an all statement.

G. To disagree with a some statement, we must make a no statement.

H. Words such as "all," "some," or "none " are connected with the concepts of subsets, intersection, and disjoint sets.

IV. Vocabulary To Stress:

negating	closed	intersection
disagreement	contradiction	disjoint
open	subset	

V. Activities:

A. Put a simple declarative statement on the board in the morning. Later on in the day see if the students can make a statement of disagreement.

* B. Draw a set of geometric shapes on the chalkboard and have students observe that all the objects in the set are shapes, some are triangles, but none are circles. Draw a set diagram to show this.

* C. Have students name other examples of sets to show the meaning of all, some, and none. Draw set diagrams for the illustrations.

12-2

Level: 12 Step: A Concept: Sets

Text References:

Book: 4

Houghton Mifflin (1967) pp. 242-243, (61), 244-246, (62)
Houghton Mifflin (1972) pp. 240-241, (60), 242-245

Book: 5

Houghton Mifflin (1967) pp. 145-155
Houghton Mifflin (1972) pp. 238, 239, (59), 242, 243, (60)
Addison-Wesley (1971, 1968) pp. 60-61

Book: 6

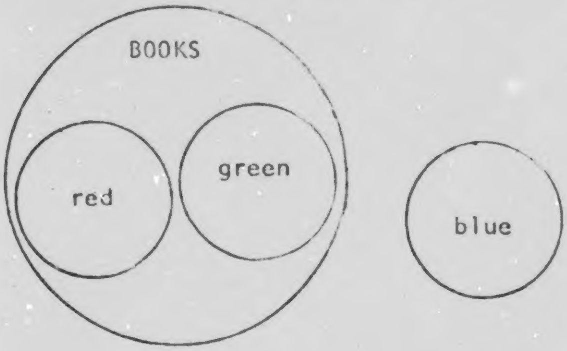
Houghton Mifflin (1967) pp. 150-153
Houghton Mifflin (1972) pp. 240-243

* Suggested Introductory Activity

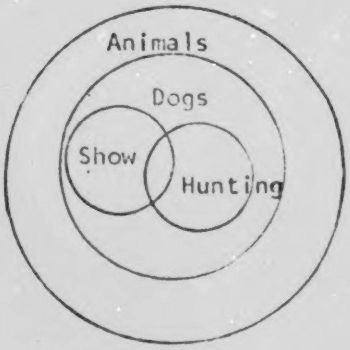
Level: 12 Step: A Concept: Sets

WORKSHEET

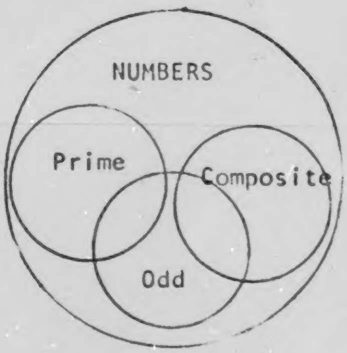
Study the set diagrams. Determine if the statements are true or false in relation to the diagram.


BOOKS
red
green
blue

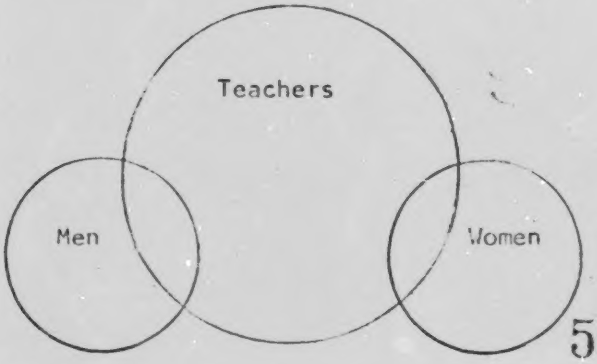
1. Some books are red.
2. All books are green.
3. Some books are blue.
4. No books are blue.


Animals
Dogs
Show
Hunting

5. Some dogs are hunters.
6. All show dogs are animals.
7. No hunting dogs are show dogs.
8. Some hunting dogs are show dogs.


NUMBERS
Prime
Composite
Odd

9. Some numbers are prime numbers.
10. No odd numbers are prime numbers.
11. All composite numbers are prime numbers.
12. Some prime numbers are odd numbers.


Teachers
Men
Women

13. No teachers are men.
14. All teachers are women.
15. Some women are teachers.
16. Some men are not teachers.

Level: 12 Step: A Concept: Sets

WORKSHEET

Draw set diagrams to illustrate the following statements.

1. All squares are polygons.

2. All triangles are polygons. A.

3. No triangles are squares.

4. Some boys dance.

5. Some girls dance. B.

6. Some boys and girls do not dance.

7. All apples are fruit.

8. Some apples are red. C.

9. No forks are fruit.

10. Some flour is made from wheat.

11. Some flour is made from rye. D.

12. No flour is made from tomatoes.

12-5

Level: 12 Step: A Concept: Numeral

I. Concept:

Numeral: Naming fractional numbers greater than 1.

II. Behavioral Objective:

The student given a fraction or a mixed numeral will be able to write either form not given.

III. Mathematical Ideas:

A. A fractional number has many names and forms. Some of these are:

a. $1 + \frac{1}{4}$ is the expanded numeral form.

b. $\frac{5}{4}$ is the form which implies division.

c. $1\frac{1}{4}$ is the mixed numeral form.

IV. Vocabulary To Stress:

mixed numeral
expended numeral
fraction
fractional number
numerator
denominator

Text References:

Book: 4

Houghton Mifflin (1967) pp. 296-299, (71)
Houghton Mifflin (1972) pp. 144-147, (36), 260-263, (65)
Addison-Wesley (1971, 1968) pp. 272-273, 309-311.

Book: 5

Houghton Mifflin (1967) pp. 192-193, (48), 214-217, (54)
Houghton Mifflin (1972)
Addison-Wesley (1971- 1968) pp. 242-244

Book: 6

Houghton Mifflin (1967) pp. 212-213, (46)
Houghton Mifflin (1972) pp. 126-127
Addison-Wesley (1971, 1968) pp. 148-149, 214-215

Book: 7

Houghton Mifflin (1967) pp. 345-348
Addison-Wesley (1971) pp. 226, (41), 227, (44)

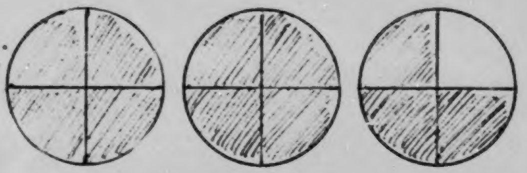
Level: 12 Step: A Concept: Numeral

WORKSHEET: NUMERAL

A whole number and a fraction used together, such as $1\frac{1}{4}$, $2\frac{1}{3}$, $3\frac{5}{6}$, is called a mixed numeral.

Write the mixed numeral to show how many wholes and how many fractional parts are shaded.

1.



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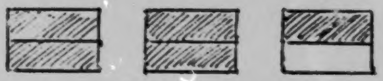
2.



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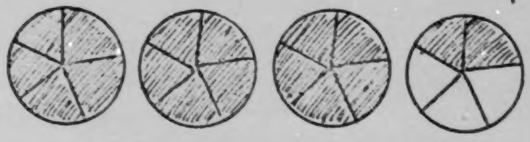

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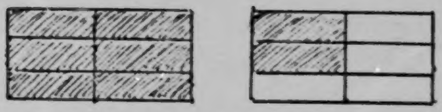
4.



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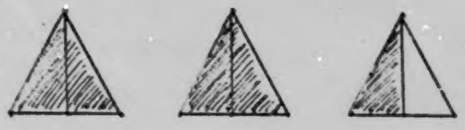
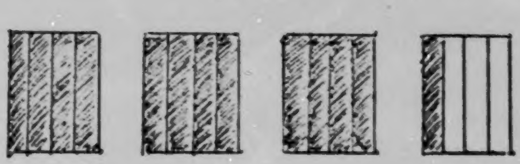
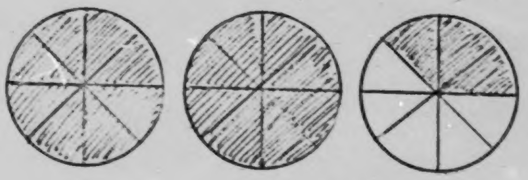
5.



6.



7. __________



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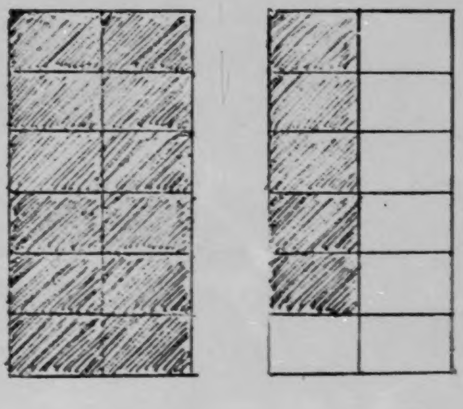
8. __________



Level: 12 Step: A Concept: Numeral

WORKSHEET

Rename these fractional numbers in their expended numeral form and mixed numeral form.

1. $\frac{8}{6}$ = ________ ________
2. $\frac{11}{7}$ = ________ ________
3. $\frac{13}{8}$ = ________ ________
4. $\frac{9}{5}$ = ________ ________
5. $\frac{12}{9}$ = ________ ________
6. $\frac{9}{2}$ = ________ ________

Rewrite each mixed numeral as a fractional number and each fractional number as a mixed numeral.

7. $9\frac{1}{3}$ = ________________
8. $7\frac{3}{5}$ = ________________
9. $3\frac{4}{5}$ = ________________
10. $12\frac{2}{3}$ = ________________
11. $1\frac{1}{8}$ = ________________
12. $\frac{9}{3}$ = ________________
13. $\frac{15}{7}$ = ________________
14. $\frac{12}{6}$ = ________________
15. $\frac{15}{11}$ = ________________
16. $\frac{10}{8}$ = ________________

Solve the equation:

17. $1 + \frac{2}{5} = \frac{\_\_\_}{5}$
18. $1 + \frac{3}{7} = \frac{\_\_\_}{7}$
19. $2 + \frac{1}{2} = \frac{\_\_\_}{2}$
20. $1 + \frac{5}{8} = \frac{\_\_\_}{8}$
21. $1 + \frac{2}{9} = \frac{\_\_\_}{9}$
22. $2 + \frac{1}{6} = \frac{\_\_\_}{6}$
23. $\frac{2}{4} + \frac{4}{4} = \frac{\_\_\_}{4}$
24. $\frac{7}{9} + \frac{\_\_\_}{9} = \frac{9}{9}$
25. $\frac{3}{10} + \frac{\_\_\_}{10} = \frac{10}{10}$
26. $\frac{1}{12} + \frac{\_\_\_}{12} = \frac{12}{12}$

Level: 12 Step: A Concept: Order

I. Concept:

Order: Comparing fractional numbers.

II. Behavioral Objective:

The student given a number sentence containing fractional numbers will be able to complete the sentence using the symbols " > ", " < ", " = ", " ≠ ".

III. Mathematical Ideas:

A. When two fractions have equal denominators, then the fraction with the greater numerator names the greater fractional number.

B. When two fractions have equal numerators, then the fraction with the lesser denominator names the greater fractional number.

C. Fractional numbers may be compared by locating them on a number line.

D. To compare two fractions having different denominators rename each fraction so that the denominators are the same, then compare the numerators.

IV. Vocabulary To Stress:

greater than	equal to	numerator
less than	not equal to	denominator

V. Activities:

* A. Draw on the board or on a sheet of paper several number lines of the same length, but divided into different fractional parts, one stacked on top of the other. This shows a visual comparison.

* B. Congruent regions may be divided into different fractional parts.

* C. List several examples of fractional numbers with like denominators. Compare these until the children can generalize the mathematical idea A.

* D. List several fractions where the numerators are the same and the denominators are different. Compare these until the children can generalize mathematical idea B.

Level: 12 Step: A Concept: Order

V. Activities (Continued)

E. "Ring and Square." Preparation: Prepare a paper with several rows of fractions. Divide the students into teams for a relay. The number of teams depends on the size of the group. The number of rows on the page depends on the size of the team. (i.e. 5 rows, 5 members). How to Play: The first member of each team puts a square around the largest fraction and a ring around the smallest fraction in the first row. When the first member finishes he passes it back. The next member puts a square around the largest fraction, and a ring around the smallest fraction in the next row. This continues until each member has completed his row of fractions. The team to finish first correctly wins. Each member of the team could use a different color and key their colors so you know the succession of the rings and squares.

Text References:

Book: 4

Houghton Mifflin (1967)	pp. 300-301
Houghton Mifflin (1972)	pp. 273, (67)
Addison-Wesley (1971, 1968)	pp. 304-305, 336, Supp. Ex. 42

Book: 5

Houghton Mifflin (1967)	pp. 199, (48)
Houghton Mifflin (1972)	pp. 129, 131, 140
Addison-Wesley (1971, 1968)	pp. 212-213

Book: 7

Houghton Mifflin (1967)	pp. 359-363
Addison-Wesley (1971)	pp. 207-210

* Suggested Introductory Activity

12-10

Level: 12 Step: A Concept: Order

WORKSHEET: ORDER

Choose the correct symbol " < ", " > ", " = ", to make the sentence true. Write the symbol in the ○.

1. $\frac{1}{2}$ ○ $\frac{5}{12}$
2. $\frac{1}{3}$ ○ $\frac{4}{9}$
3. $\frac{1}{4}$ ○ $\frac{3}{16}$
4. $\frac{1}{3}$ ○ $\frac{3}{12}$
5. $\frac{1}{2}$ ○ $\frac{3}{4}$
6. $\frac{5}{6}$ ○ $\frac{5}{12}$
7. $\frac{2}{5}$ ○ $\frac{4}{15}$
8. $\frac{3}{10}$ ○ $\frac{3}{20}$
9. $\frac{3}{5}$ ○ $\frac{14}{15}$
10. $\frac{2}{12}$ ○ $\frac{1}{6}$
11. $\frac{6}{10}$ ○ $\frac{3}{5}$
12. $\frac{3}{8}$ ○ $\frac{6}{24}$
13. $\frac{2}{2}$ ○ $\frac{8}{8}$
14. $\frac{3}{4}$ ○ $\frac{11}{12}$
15. $\frac{7}{12}$ ○ $\frac{2}{3}$
16. $\frac{1}{2}$ ○ $\frac{6}{12}$
17. $\frac{1}{5}$ ○ $\frac{3}{10}$
18. $\frac{1}{2}$ ○ $\frac{5}{10}$
19. $\frac{1}{4}$ ○ $\frac{5}{40}$
20. $\frac{3}{8}$ ○ $\frac{12}{40}$
21. $\frac{2}{6}$ ○ $\frac{1}{3}$
22. $\frac{1}{2}$ ○ $\frac{3}{6}$
23. $\frac{1}{3}$ ○ $\frac{3}{6}$
24. $\frac{3}{4}$ ○ $\frac{1}{2}$
25. $\frac{1}{2}$ ○ $\frac{2}{4}$
26. $\frac{3}{8}$ ○ $\frac{1}{4}$
27. $\frac{2}{3}$ ○ $\frac{4}{6}$
28. $\frac{1}{2}$ ○ $\frac{4}{8}$
29. $\frac{3}{4}$ ○ $\frac{5}{8}$
30. $\frac{1}{4}$ ○ $\frac{2}{8}$

Level: 12 Step: A Concept: Order

WORKSHEET

Choose the correct symbol " < ", " > ", " = ", to make the statement true. Write the symbol in the ○. Prove your answer by means of number lines or congruent regions.

1. $\frac{1}{2}$ ○ $\frac{3}{4}$

2. $\frac{5}{6}$ ○ $\frac{2}{3}$

3. $\frac{4}{9}$ ○ $\frac{1}{3}$

4. $\frac{2}{5}$ ○ $\frac{4}{10}$

5. $\frac{1}{8}$ ○ $\frac{1}{4}$

6. $\frac{4}{6}$ ○ $\frac{1}{3}$

7. $\frac{1}{3}$ ○ $\frac{1}{2}$

8. $\frac{2}{3}$ ○ $\frac{3}{4}$

9. $\frac{1}{2}$ ○ $\frac{2}{3}$

10. $\frac{3}{4}$ ○ $\frac{5}{8}$

12-12

Level: 12 Step: A Concept: Addition

I. Concept:

Addition: Adding an unlimited number of addends each having 4-6 digits.

II. Behavioral Objective:

The student given an unlimited number of addends each having 4-6 digits will be able with renaming to name the sum.

III. Mathematical Ideas:

A. Once the principle of adding numbers greater than 10 has been established with the students, the process can be extended without too much difficulty.

IV. Vocabulary To Stress: addend renaming

V. Activities:

A. Relay using teams of children. Write a column of three-place addends on the board depending on the number of the children on the team. The first member of each team writes the first two numbers and totals it. The second member adds the third number on the board to the sum given by the first member. This continues until all numbers have been added.

162		
425	162 425 587	1st pupil
316	316 903	2nd pupil
214	214 1117	3rd pupil
186	186 1303	4th pupil
192	192 1495	5th pupil

B. Give the children old catalogs. Have them cut out pictures of items they want. Make sure the price of the item is included. Let the students total the amount of their items. You can give them a limited amount of money. The same thing can be done with a grocery ad or even a menu. Have the children cut out pictures from the catalog along with the price. Tell them they have a certain amount such as $2,000, or they have won a contest and have $85,000, etc. They can pick out that amount of merchandise. They must add up all of their purchases correctly. They can cut out the pictures, and paste them on a paper.

Level: 12 Step: A Concept: Addition

Text References:

Book: 3

Houghton Mifflin (1967) pp. 282, 321
Houghton Mifflin (1972) pp. 248, 250 (+ & -), 300, #16-25

Book: 4

Houghton Mifflin (1967) pp. 52, 240 (also sub.), 340 #1-14
Houghton Mifflin (1972) pp. 48
Addison-Wesley (1971, 1968) pp. 38-39, (11), 40, (12), 41-42, (14), 43, 62-63 (+ & -), 78 (+ & -), Supp. Ex. 11, 12, 13, 14, 16

Book: 5

Houghton Mifflin (1967) pp. 40-42, 46-47, (12), 48-49, (13), 50, (14), 51, 60, 316, 317
Houghton Mifflin (1972) pp. 43, 56, (11), 335
Addison-Wesley (1971, 1968) pp. 102-104, (2, 3, 4, 16, 17) 58-59, 46-49, 329-330

Book: 6

Houghton Mifflin (1967) pp. 35, (6), 53
Houghton Mifflin (1972) pp. 32
Addison-Wesley (1971, 1968) pp. 40, (7, 8, 9)

Book: 7

Houghton Mifflin (1967) pp. 138-140, (22) 141-143
Addison-Wesley (1971) pp. 103-105, (15)

Level: 12 Step: A Concept: Addition

WORKSHEET

Rewrite these problems in column form and find the sums.

1. 8047 + 3652 = ______

2. 5037 + 2369 = ______

3. 7775 + 967 = ______

4. 4557 + 2879 = ______

5. 59,969 + 35,899 = ______

6. 37,497 + 46,789 = ______

7. 48,364 + 4760 = ______

8. 27,419 + 654 = ______

9. 13,276 + 8463 + 370,428 = ______

10. 543,208 + 8716 + 18,264 = ______

11. 568,723 + 26,843 = ______

12. 497,628 + 107,354 = ______

Find the sum:

13.
$$\begin{array}{r} 541{,}231 \\ 133{,}242 \\ \underline{111{,}246} \end{array}$$

14.
$$\begin{array}{r} 116{,}219 \\ \underline{324{,}721} \end{array}$$

15.
$$\begin{array}{r} 343{,}269 \\ \underline{421{,}687} \end{array}$$

16.
$$\begin{array}{r} 321{,}246 \\ 472{,}137 \\ \underline{103{,}821} \end{array}$$

Level: 12 Step: A Concept: Subtraction

I. Concept:

Subtraction: Subtracting numbers of 4-6 digits with renaming.

II. Behavioral Objective:

The student given a sum and an addend of 4-6 digits will be able with renaming to name the missing addend or difference.

III. Mathematical Ideas:

A. Subtraction is the opposite of addition.

B. Subtraction is the process of renaming a sum and an addend as a missing addend or the difference.

C. Subtraction involves renaming 1 ten as 10 ones, 1 hundred as 10 tens, etc. Once this principle of subtraction with renaming has been established with the students, it can be extended without much difficulty.

IV. Vocabulary To Stress:

subtraction difference missing addend

V. Activities:

* A. Use base ten blocks to help with renaming.

B. Relay game. Each team will be made up of 5 or more members depending on the number of digits in the problem placed on the board. Each member of the team subtracts one digit. The team that finishes first correctly is the winner. (See 12 A Addition)

Text References:

Book: 3

Houghton Mifflin (1972) pp. 249, 250 (+ & -)

Book: 4

Houghton Mifflin (1967) pp. 53, 240 (also add.)
Houghton Mifflin (1972) pp. 49
Addison-Wesley (1971, 1968) pp. 52, (8), 53, (19), 54, 58, (20,21) 62-63 (+ & -)
78 (+ & -)
Supp. Ex. 19, 21, 22

Book: 5

Houghton Mifflin (1967) pp. 41, 52-53, (15), 54, 60, (16), 106, (20), 107, (21), 108, (22)
Houghton Mifflin (1972) pp. 46, (12), 56, 58
Addison-Wesley (1971, 1968) pp. 106-107, (20)

12-16

Level: 12 Step: A Concept: Subtraction

Text References: continued

Book: 6

Houghton Mifflin (1967) pp. 38, (7)
Houghton Mifflin (1972) pp. 36
Addison-Wesley (1971, 1968) pp. 42, (7, 8, 9)

Book: 7

Houghton Mifflin (1967) pp. 144, (23), 145-149
Addison-Wesley (1971) pp. 106, (15), 107

Level: 12 Step: A Concept: Subtraction

WORKSHEET

Subtraction.

1. 7015
- 2759

2. 6103
- 5976

3. 72,903
- 62,457

4. 3209
- 1762

5. 8059
- 3674

6. 1043
- 962

7. 17,304
- 12,756

8. 6304
- 5265

9. 9015
- 2867

10. 3214
- 1904

11. 72,706
- 51,837

12. 2056
- 928

13. 4906
- 3085

14. 3107
- 2985

15. 8420
- 6175

16. 57,210
- 38,426

17. 527,640
- 146,839

18. 604,279
- 263,584

Level: 12 Step: A Concept: Multiplication

I. Concept:

Multiplication: Multiplying with one 2-digit factor and one 3-digit factor.

II. Behavioral Objective:

The student given one 2 digit factor and a 3-digit factor will be able to name the product.

III. Mathematical Ideas:

A. Multiplication is distributive over addition.

B. Multiplication is associative.

C. Multiplication is commutative.

IV. Vocabulary To Stress:

factors product partial product

Text References:

Book: 4

Houghton Mifflin (1967) pp. 229
Houghton Mifflin (1972) pp. 227
Addison-Wesley (1971, 1968) pp. 144-145, 147, 182, 185, (38), 187, (39)
Supp. Ex. 33

Book: 5

Houghton Mifflin (1967) pp. 111, (32), 112-113, (33), 142-143, 321
Houghton Mifflin (1972) pp. 77, (21, 22), 78, 79, 80
Addison-Wesley (1971, 1968) pp. 114-116, (26, 29)

Book: 7

Houghton Mifflin (1967) pp. 149, (24), 150-154
Addison-Wesley (1971) pp. 109, (16), 110-111

Other References:

Franklin Mathematical Series, Lyons Carnahan, Patterns and Puzzles in Mathematics, pp. 86-89

12-19

Level: 12 Step: A Concept: Multiplication

WORKSHEET: MULTIPLICATION

Name the product.

1. 465
x 23

2. 654
x 35

3. 546
x 47

4. 247
x 65

5. 839
x 27

6. 674
x 76

7. 976
x 45

8. 652
x 79

9. 346
x 38

10. 472
x 65

11. 588
x 37

12. 296
x 54

13. $9.02
19

14. $3.45
54

15. $2.46
26

16. $6.05
86

17. $8.93
75

18. $9.17
56

19. $7.65
34

20. $6.52
48

Level: 12 Step: A Concept: Division

I. Concept:

Division: Dividing a 3-digit dividend by a 2-digit divisor with a remainder.

II. Behavioral Objective:

The student given a 3-digit dividend (product) and a 2-digit divisor (factor) will be able to name the quotient with a remainder.

III. Mathematical Ideas:

A. Division is the process of repeated subtraction.

B. The quotient is the number of times you subtract the divisor from the dividend.

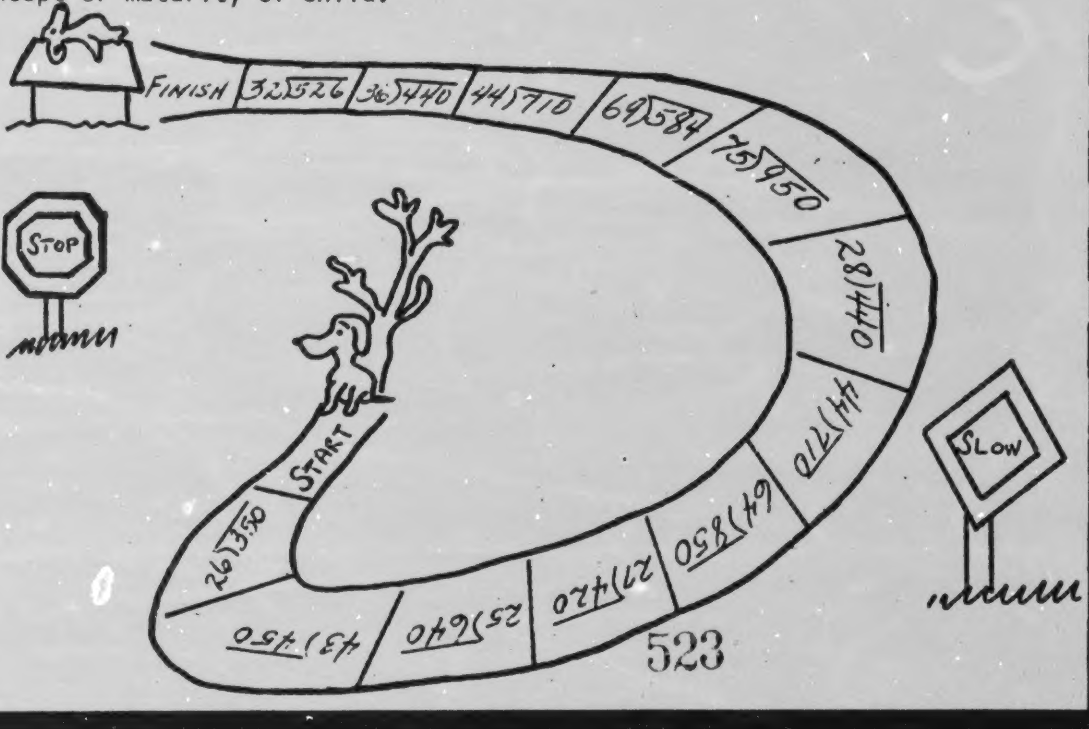
C. Division is the opposite of multiplication.

IV. Vocabulary To Stress:

divisor (factor) dividend (product remainder
quotient (missing factor)

V. Activities:

A. Snoopy Game. Get Snoopy from the yard to the doghouse by use of a spinner or die to show the number of boxes to advance. Correct answer allows player to remain in space until the next spin. Wrong answer makes player return to preceding position. Answers could be put on an answer sheet for ready checking. Any type of problem could be used depending on difficulty of concept or maturity of child.



Level: 12 Step: A Concept: Division

Text References:

Book: 4

Houghton Mifflin (1967) pp. 251-252, (60)
Houghton Mifflin (1972) pp. 249, (60), Supp. Ex. p. 352
Addison-Wesley (1971, 1968) pp. 145, 147, 221, 223, 225, (50, 51, 53), 226, Supp. Ex. 38, 39

Book: 5

Houghton Mifflin (1967) pp. 126, (37)
Houghton Mifflin (1967) pp. 181, 182, 343
Addison-Wesley (1971, 1968) pp. 133, (34), 135, (35), 136, 333

Book: 6

Houghton Mifflin (1967) pp. 60-63, 65 #32-43

Houghton Mifflin (1972) pp. 79-81
Addison-Wesley (1971, 1968) pp. 58-59, (16), 60-61

Book: 7

Houghton Mifflin (1967) pp. 155-159
Addison-Wesley (1971) pp. 120, (20), 121, (21), 122

Other References:

Modern Mathematics Filmstrip 744: 20-38

12-22

Level: 12 Step: A Concept: Division

WORKSHEET: DIVISION

Name the quotient.

1. $84\overline{)\,735}$

6. $19\overline{)\,116}$

2. $29\overline{)\,216}$

7. $63\overline{)\,378}$

3. $48\overline{)\,542}$

8. $95\overline{)\,275}$

4. $52\overline{)\,175}$

9. $79\overline{)\,462}$

5. $34\overline{)\,312}$

10. $47\overline{)\,349}$

Level: 12 Step: A Concept: Function

I. Concept:

Function: Using two operations to find the second member of an ordered pair.

II. Behavioral Objective:

The student given the function rule with two operations will be able to complete the set of ordered pairs.

III. Mathematical Ideas:

A. A function is a set of ordered number pairs that each first member of any pair is associated with only one second member.

B. A function is usually associated with a general rule for determining the ordered pairs.

C. A function rule may be stated as an equation.

IV. Vocabulary To Stress:

function	ordered pair
rule	function rule

V. Activities:

* A. Review functions with one operation.

* B. "Guess-the-rule" game. Addison-Wesley p. 100. (Book 4). One child thinks of a rule, such as "add 8", the other children give him numbers, and then he gives the answers until the class guesses the rule. You might restrict the guess-the-rule game to addition and multiplication, because of the problems which arise with subtraction and division. If you wish to allow subtraction and division rules, you should vary the game by having one child think of the rule and also give the numbers and answers so that the other children can guess the rule.

Text References:

Book: 4

Addison-Wesley (1971, 1968) pp. 100-101

Book: 5

Houghton Mifflin (1967) pp. 180-181
Houghton Mifflin (1972) pp. 34-37, (9), 172, 173
Addison-Wesley (1971, 1968) pp. 24-25, 27, 33, 38-39, 44-45

Level: 12 Step: A Concept: Function

Text References: continued

Book: 6

Houghton Mifflin (1967) pp. 46-47, 64
Houghton Mifflin (1972) pp. 54-55, 338 #18-23
Addison-Wesley (1971, 1968) pp. 20-27

Book: 7

Addisom-Wesley (1971) pp. 42-44, (7)

* Suggested Introductory Activity

Level: 12 Step: A Concept: Function

WORKSHEET

Use the rule to complete the set of number pairs.

1. $(m \times 2) + 5 = n$: {(5,___) (9,___) (3,___) (8,___) (2,___)}
2. $(m \times 4) - 1 = n$: {(5,___) (9,___) (3,___) (8,___) (2,___)}
3. $(m \times 6) - 3 = n$: {(5,___) (9,___) (6,___) (8,___) (10,___)}
4. $(m \times 10) + 4 = n$: { (4,___) (7,___) (5,___) (9,___) (8,___)}
5. $(m \div 4) + 3 = n$: {(28,___) (40,___) (16,___) (36,___) (12,___)}
6. $(m \div 2) + 1 = n$: {(20,___) (16,___) (10,___) (14,___) (8,___)}
7. $(m \times 8) - 4 = n$: {(3,___) (5,___) (1,___) (7,___) (2,___)}
8. $(m \div 5) + 2 = n$: {(15,___) (40,___) (10,___) (50,___) (35,___)}
9. $(m \div 3) + 1 = n$: {(15,___) (30,___) (27,___) (18,___) (12,___)}
10. $(m \div 6) + 2 = n$: {(36,___) (54,___) (6,___) (18, ___) (48, ___)}

Determine the rule for the following sets of ordered pairs.

11. {(4,13) (1,4) (6,19) (8,25) (5,16) (2,7)} ____________________
12. {(12,7) (20,11) (8,5) (18,10) (16,9) (6,4)} ____________________
13. {(5,23) (8,38) (1,3) (10,48) (4,18) (7,33)} ____________________
14. {(20,8) (40,13) (4,4) (32,11) (16,7) (24,9)} ____________________
15. {(3,10) (8,30) (5,18) (9,34) (2,6) (7,26)} ____________________

12-26

Level: 12 Step: A Concept: Geometry

I. Concept:

Geometry: Introducing the simple closed surfaces of cylinder, cone, pyramid.

II. Behavioral Objective:

The student given drawings of geometric shapes will be able to identify cones, cylinders, and pyramids and their properties.

III. Mathematical Ideas:

A. A simple closed surface separates the points in space into three sets: points on the surface, points inside the surface, points outside the surface.

B. A pyramid is a simple closed surface formed by joining a polygonal region, called the base, with triangular regions that come together in a single point.

C. A circular cone is a simple closed surface formed by joining a circular region, called the base, with a curved surface that comes together at a point called the vertex (apex).

D. A cylinder is a simple closed space figure formed by the union of two circular regions, and a curved surface which encloses a space.

E. The area inside a circle is a circular region.

IV. Vocabulary To Stress:

cone
cylinder
closed space figure
pyramid
triangular pyramid
base
circular region
circular cone
faces
edges
vertices
simple closed surfaces
square pyramid

V. Activities:

Students need numerous opportunities to verbalize regarding the properties of these shapes.

* A. Show models of these simple closed surfaces and have children describe them to determine their properties.

* B. Have the children construct models.

C. The class can make mobiles of the different shapes.

* D. Blindfold a child. Hand him one of the geometric shapes. Let him tell as many properties of the object as he can before identifying it.

Level: 12 Step: A Concept: Geometry

Text References:

Book: 4

Houghton Mifflin (1967) pp. 260-263
Houghton Mifflin (1972) pp. 292, 294-296
Addison-Wesley (1971, 1968) pp. 196-199

Book: 5

Houghton Mifflin (1967) pp. 82, 84, (23)
Houghton Mifflin (1972) pp. 112, 113, 114, 115, (31)
Addison-Wesley (1971, 1968) pp. 278-279

Book: 6

Houghton Mifflin (1967) pp. 88-89
Houghton Mifflin (1972) pp. 115-116
Addison-Wesley (1971, 1968) pp. 256-259

Book: 7

Addison-Wesley (1971) pp. 387-389

* Suggested Introductory Activity

12-28

Level: 12 Step: A Concept: Measurement

I. Concept:

Measurement: Measuring a line segment to one eighth inch.

II. Behavioral Objective:

The student given a line segment will be able to determine its measurement to the one eighth inch.

III. Mathematical Ideas:

A. To measure a quantity, we compare it with a unit.

B. Units of measurement are arbitrarily determined. These units are standardized for uniformity and ease in communication.

C. The number of units that match a quantity being measured is called its measure.

IV. Vocabulary To Stress:

unit of measurement measure (noun) measure (verb)

V. Activities:

Using overhead projector or other aid, review general concept of fractional inch measures.

Text References:

Book: 4

none given

Book: 5

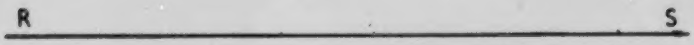
Houghton Mifflin (1972) pp. 94

12-29

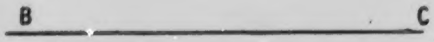
Level: 12 Step: A Concept: Measurement

WORKSHEET

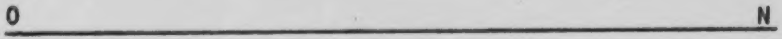
Measure these line segments carefully. Name the measure of each.

1. 

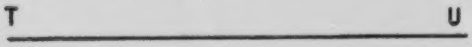
$M(\overline{RS})$ = ____

2. 

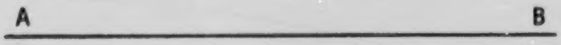
$M(\overline{BC})$ = ____

3. 

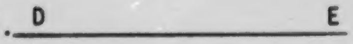
$M(\overline{ON})$ = ____

4. 

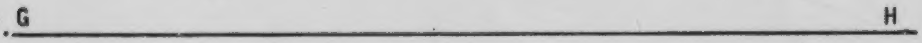
$M(\overline{TU})$ = ____

5. 

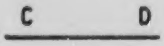
$M(\overline{AB})$ = ____

6. 

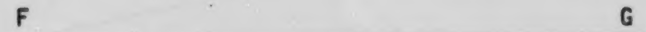
$M(\overline{DE})$ = ____

7. 

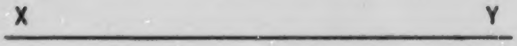
$M(\overline{GH})$ = ____

8. 

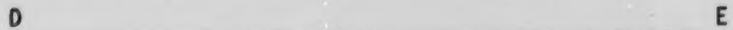
$M(\overline{CD})$ = ____

9. 

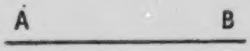
$M(\overline{FG})$ = ____

10. 

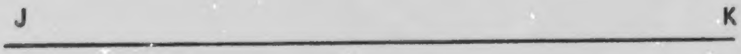
$M(\overline{XY})$ = ____

11. 

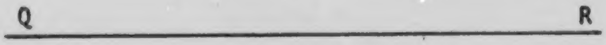
$M(\overline{DE})$ = ____

12. 

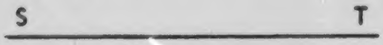
$M(\overline{AB})$ = ____

13. 

$M(\overline{JK})$ = ____

14. 

$M(\overline{QR})$ = ____

15. 

$M(\overline{ST})$ = ____

Level: 12 Step: A Concept: Measurement

WORKSHEET

Draw line segments to the following measures. Label each.

1. $M(\overline{AB}) = 2\frac{1}{8}$ in.

2. $M(\overline{CD}) = 3\frac{3}{8}$ in.

3. $M(\overline{EG}) = 1\frac{5}{8}$ in.

4. $M(\overline{KL}) = 2\frac{7}{8}$ in.

5. $M(\overline{MN}) = 3\frac{1}{8}$ in.

6. $M(\overline{OP}) = 2\frac{5}{8}$ in.

7. $M(\overline{QR}) = 1\frac{3}{8}$ in.

8. $M(\overline{ST}) = 2\frac{3}{8}$ in.

9. $M(\overline{UV}) = 3\frac{5}{8}$ in.

10. $M(\overline{WX}) = 1\frac{1}{8}$ in.

Level: 12 Step: B Concept: Sets

I. Concept:

Sets: Applying reason in making simple deduction.

II. Behavioral Objective:

The student given sets or statements will be able to draw a conclusion of simple deduction.

III. Mathematical Ideas:

A. An if-then statement is conditional.

B. If-then statements are related to sets and subsets.

C. If we know that in a certain situation one of several possibilities may be true; and if we are able to eliminate (exhaust) all the possibilities except one, we can conclude that the remaining possibility is the only acceptable one.

D. Set diagrams may be used to illustrate deductions by the method of exhaustion.

IV. Vocabulary To Stress:

elimination	conclusion	possibility
exhaust	deduction	

V. Activities:

* A. See Houghton Mifflin 4, p. 247. "Procedures and Activities".

Text References:

Book: 4

Houghton Mifflin (1967) pp. 247-249, (63)
Houghton Mifflin (1972) pp. 245-247, (61)

Book: 5

Houghton Mifflin (1967) pp. 150-155
Houghton Mifflin (1972) pp. 238, 240-247, (60)
Addison-Wesley (1971, 1968) pp. 60-61

Book: 6

Houghton Mifflin (1967) pp. 154-159
Houghton Mifflin (1972) pp. 7, 244-246

* Suggested Introductory Activity

Level: 12 Step: B Concept: Numeral

I. Concept:

Numeral: Using factors and exponents to express a product.

II. Behavioral Objective:

The student given a set of repeated factors or a factor with an exponent will be able to write the one not given and its product.

III. Mathematical Ideas:

A. An exponent is a small numeral written above and to the right of another numeral.

B. The exponent tells how many times the base number appears as a factor.

C. An exponent names a power of a factor.

D. The exponent names the number of places to the left of the ones' place when the base is ten.

thou.	hun.	tens	ones
10^3	10^2	10^1	10^0

IV. Vocabulary To Stress:

exponent factor product
power

V. Activities:

* A. Do repeated multiplication. Example: 6 x 6 x 6. What is the factor? (6) How many times does it appear as a factor? (3) This could be repeated until the children have this pattern firmly in mind. Then introduce the idea that the number of times a factor is repeated is the exponent and show how to write the exponent.

Text References:

Book: 4

Houghton Mifflin (1967) pp. 210-212, (57)
Houghton Mifflin (1972) pp. 176-178

Book: 5

Houghton Mifflin (1967) pp. 20-21, (6), 177
Houghton Mifflin (1972) pp. 18, 19, (5)

Level: 12 Step: 8 Concept: Numeral

Text References: continued

Book: 6

Houghton Mifflin (1967) pp. 17, 19
Houghton Mifflin (1972) pp. 13-15
Addison-Wesley (1971, 1968) pp. 10-13

Book: 7

Houghton Mifflin (1967) pp. 112, (17), 113-115
Addison-Wesley (1971) pp. 8-11, 113-114

Other References:

Modern Mathematics Filmstrip 760: 15-21

* Suggested Introductory Activity

12-34

Level: 12 Step: B Concept: Numeral

WORKSHEET: NUMERAL

Complete the chart.

	NUMERAL	FACTORS	PRODUCT
	2^5	2 × 2 × 2 × 2 × 2	32
1.	3^3		
2.	4^2		
3.		5 × 5	25
4.	9^3		
5.		6 × 6 × 6	216
6.		12 × 12	144
7.		7 × 7 × 7	343
8.	2^3		
9.	3^4		
10.		5 × 5 × 5 × 5	625

Level: 12 Step: B Concept: Numeral

WORKSHEET: NUMERAL

Complete the chart.

	NUMERAL	FACTORS	PRODUCT
1.	7^2		
2.		2 x 2 x 2 x 2	
3.	5^3		
4.		4 x 4 x 4 x 4 x 4	
5.		8 x 8	
6.		7 x 7 x 7 x 7	
7.	9^2		
8.		6 x 6 x 6 x 6 x 6	
9.	2^7		
10.		4 x 4 x 4 x 4 x 4 x 4 x 4	
11.	20^2		
12.		11 x 11 x 11	
13.	4^4		
14.	8^3		
15.	1^8		

Level: 12 Step: B Concept: Addition, Subtraction, Multiplication, Division

I. Concept:

Addition, Subtraction, Multiplication, Division: Solving two-stage word problems.

II. Behavioral Objective:

The student given two-stage word problems will be able to determine the operations and solve the problems.

III. Mathematical Ideas:

A. Word problems include sets that may be joined, separated, or compared. Basic number operations are associated with these set operations.

B. Word problems may require a combination of basic operations for solution.

C. The five-step method is used in solving word problems.

IV. Vocabulary To Stress:

equation five-step method two-stage

Text References:

Book: 4

Houghton Mifflin (1967) pp. 122-123, 149, 206
Houghton Mifflin (1972) pp. 88-89, (23), 172
Addison-Wesley (1971, 1968) pp. 102, 111, 143, 317

Book: 5

Houghton Mifflin (1967) pp. 38 - 5 step method, 57, 143
Houghton Mifflin (1972) pp. none
Addison-Wesley (1971, 1968) pp. 42

Book: 6

Houghton Mifflin (1967) pp. 40-41 (parts), 48
Houghton Mifflin (1972) pp. 33, 43, 49, 51
Addison-Wesley (1971, 1968) pp. 44-45, 73

Book: 7

Addison-Wesley (1971) pp. (22, 23, 24, 43)

Other References:

Imperial Tapes (Intermediate) #28

* Modern Mathematics Filmstrip #749

* Suggested Introductory Activity

Level: 12 Step: B Concept: Addition, Subtraction, Multiplication, Division

WORKSHEET

WORD PROBLEMS WITHOUT NUMBERS

Tell whether you should add, subtract, multiply, or divide to solve each problem.

1. If you know how many apples there are in a box, how can you find the number of dozens in it?

   ____

2. Susan wants to buy a number of candy bars. She knows the cost of one bar. How can she find the cost of 8 bars?

   ____

3. If you know in what year Lincoln was born and in what year he died, how can you tell how old he was when he died?

   ____

4. If you know how many children there are in each room in your school, how can you find out the number of children in the shole school?

   ____

5. Ann knows the cost of a pound of meat. How can she find out the cost of more than one pound?

   ____

6. Mary knows the cost of a list of groceries she bought for her mother, She also knows the amount of money her mother gave her. How can she find out how much money she should have left.

   ____

12-38

Level: 12 Step: B Concept: Addition, Subtraction, Multiplication, Division

WORKSHEET: WORD PROBLEMS

Write a number sentence and solve it for each word problem. Show your work.

1. For the class luncheon, Miss Green bought 3 quarts of ice cream at 65 cents a quart, and four cartons of soda at 72 cents a carton. How much did Miss Green spend in all?

   ____

2. Bob wants to buy a baseball glove and bat. The glove costs $5.75. The bat costs #3.50. He saved $12.00. How much money will he have left after buying these things?

   ____

3. At the sale Mrs. Jones bought 8 glasses at 37 cents each and 5 cups at 29 cents each. How much more were the glasses than the cups?

   ____

4. In the school library there are 16 shelves of books on the north wall. There are 928 books on these 16 shelves. How many books are on each shelf? On the east wall there are 12 shelves. There are 540 books on these 12 shelves. How many books are on each shelf? How many more books per shelf are there on the north wall?

   ____

5. Larry took a plane trip to see his grandparents. The air distance was 85 miles. His dad went to pick him up a week later in the car. When he left home his mileage guage showed 15,265; when he returned home the mileage guage showed 15,386. How much longer was the trip by car than by plane?

   ____

6. The class kept a record of students eating hot lunch for 5 days. On Monday 24 students ate hot lunch, Tuesday 22, Wednesday 26, Thursday 25, and Friday 23. What was the average number of students eating hot lunch that week?

   ____

Level: 12 Step: B Concept: Geometry

I. Concept:

Geometry: Introducing volume of cubes and simple closed surfaces.

II. Behavioral Objective:

The student given a simple closed surface will be able to give the volume in cubic units.

III. Mathematical Ideas:

A. Volume is the measure of a closed surface.

B. Volume may be found by comparing a cubic unit, perhaps a cubic inch, with the space inside the closed surface.

C. A cubic inch is a standard unit of measure of volume.

D. The result of the comparison of the cubic unit with the closed surface is called the measure of the space figure. In a mathematical sentence it is written "m(A)".

E. Volume may be expressed as the formula V = l x w x h.

IV. Vocabulary To Stress:

volume cube cubic unit
cubic inch

V. Activities:

* A. Use sugar cubes glued together to visually show volume. To see how many faces a cube has, each face could be painted a different color.

* B. Provide cubes or let children make them. It is important that they handle the cubes or blocks in forming different types of figures.

* C. Make closed surface figures using graph paper. Then determine the cubic units in each.

Text References:

Book: 3

Houghton Mifflin (1967) pp. 238-239
Houghton Mifflin (1972) pp. 294-295
Addison-Wesley (1971, 1968) pp. 182-183

Text References: continued

Book: 4

Houghton Mifflin (1967)	pp. 265, 268, (66), 269
Houghton Mifflin (1972)	pp. 300, 302-303, (74)
Addison-Wesley (1971, 1968)	pp. 122-123, 179, 192-195

Book: 5

Houghton Mifflin (1967)	pp. 87, (24)
Houghton Mifflin (1972)	pp. 116, 117, (32), 304, 308-311, (74)
Addison-Wesley (1971, 1968)	pp. 282-283

Book: 6

Houghton Mifflin (1967)	pp. 91, 93, 109, 270
Houghton Mifflin (1972)	pp. 118, 312, 314
Addison-Wesley (1971, 1968)	pp. 262

Book: 7

Houghton Mifflin (1967)	pp. 454-457
Addison-Wesley (1971)	pp. 184-186

Other References:

Bell, Stuart E., Mathematics in the Making 3, Looking at Solids, Houghton Mifflin.

Franklin Mathematical Series, Lyons Carnahan, Learning About Measurement, pp. 54-59

Franklin Mathematical Series, Lyons Carnahan, Patterns and Puzzles in Mathematics, pp. 19-23, 30-32.

Imperial Tapes (Intermediate) Lesson 38

* Modern Mathematics Filmstrips 745: 22-38

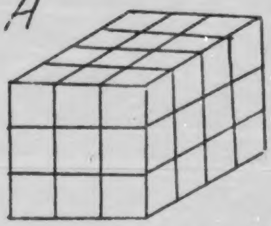
* Suggested Introductory Activity

Level: 12 **Step:** B **Concept:** Geometry

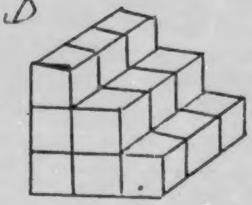
WORKSHEET: GEOMETRY

How many cubic units match each closed surface?

A



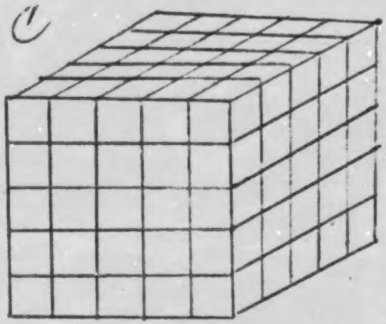
B



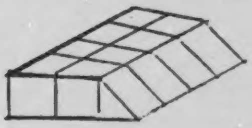
m (A) = ______________________

m (B) = ______________________

C



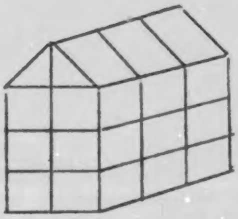
D



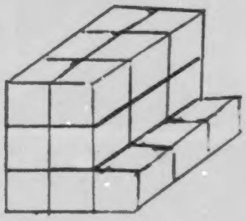
m (C) = ______________________

m (D) = ______________________

E



F



m (E) = ______________________

m (F) = ______________________

Level: 12 Step: B Concept: Measurement

I. Concept:

Measurement: Introducing the units of meter, millimeter, and centimeter in the metric system.

II. Behavioral Objective:

The student given a set of line segments will be able to measure their length in centimeters.

III. Mathematical Ideas:

A. The metric system only uses powers of ten in naming units.

B. A meter is 100 centimeters.

C. A centimeter is 10 millimeters.

D. A millimeter is $\frac{1}{10}$ of a centimeter.

IV. Vocabulary To Stress:

metric meter millimeter centimeter

V. Activities:

* A. Measure common objects in centimeters.

Text References:

Book: 3

Houghton Mifflin (1972) pp. 105, 107

Book: 4

Houghton Mifflin (1967) pp. 335-336, (79)
Houghton Mifflin (1972) pp. 102-105, (26), 285, 287, 324-325
Addison-Wesley (1971, 1968) pp. 115, 132

Book: 5

Houghton Mifflin (1967) pp. 26-27
Addison-Wesley (1971, 1968) pp. 83

Book: 6

Houghton Mifflin (1967) pp. 27
Houghton Mifflin (1972) pp. 21
Addison-Wesley (1971, 1968) pp. 101

Book: 7

Addison-Wesley (1971) pp. 324-327

* Suggested Introductory Activity

Level: 12 Step: B Concept: Measurement

WORKSHEET

Directions: Determine the length of these lines in centimeters. Write the length of the line at the end of each line.

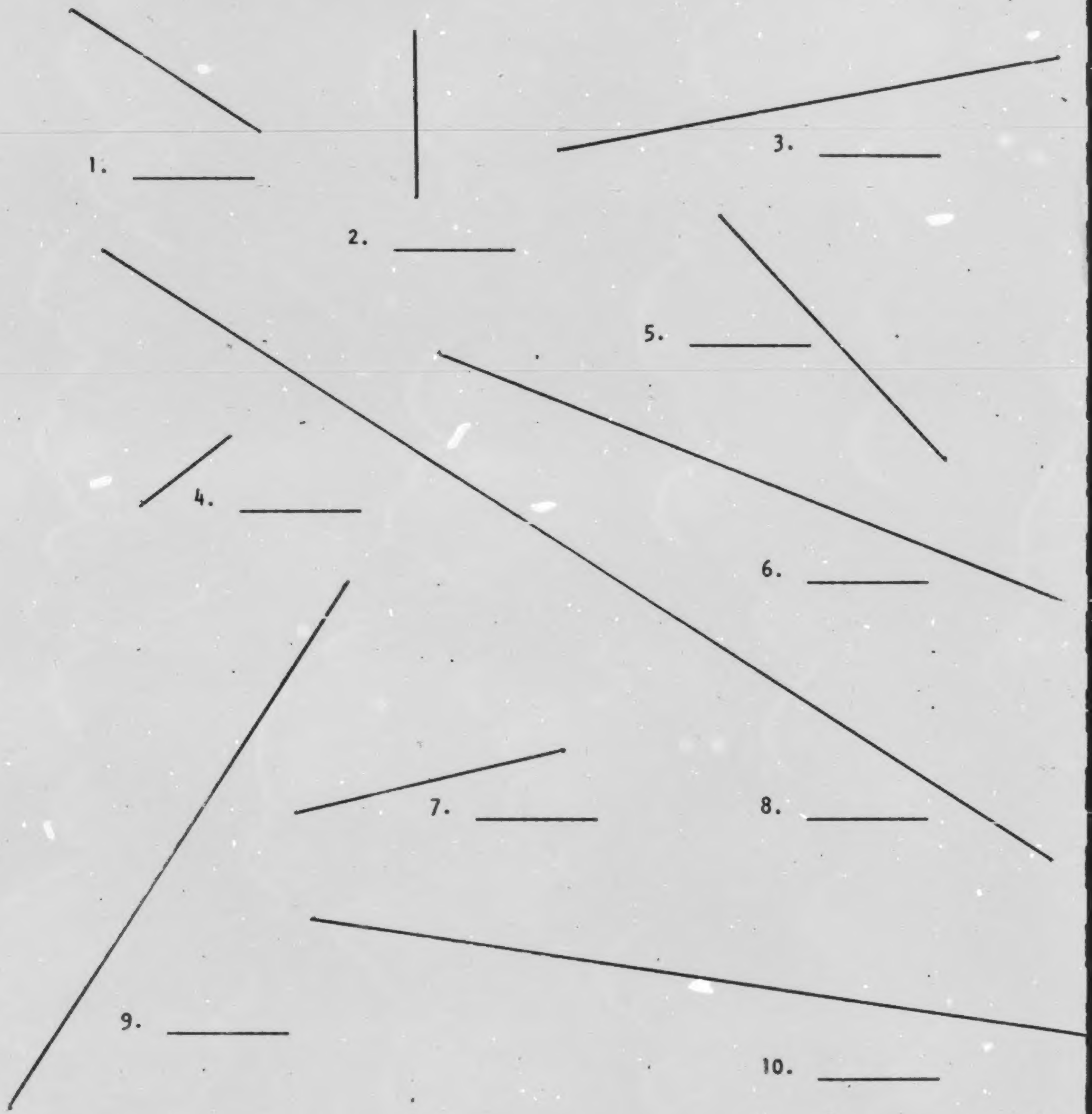
1. ______________________
2. ____________
3. __________________________
4. ____________________________________
5. __________________
6. ______________________________
7. _________
8. _________________________________
9. ____
10. ____________________________________
11. ___________________________
12. ____
13. _______________
14. _______________________________________
15. ____

12-44

Level: 12 Step: B Concept: Measurement

WORKSHEET

Directions: Measure these line segments in centimeters. Write the length of each line on the line by the number indicated.



1. ________

2. ________

3. ________

4. ________

5. ________

6. ________

7. ________

8. ________

9. ________

10. ________

Level: 12 Step: Z Concept: Sets

I. Concept:

Sets: Introducing a mathematical system without numbers. (To be used after clock arithmetic).

II. Behavioral Objective:

The student given symbols in another mathematical system will be able to complete an addition and multiplication chart.

III. Mathematical Ideas:

A. A number system is made up of numbers and number operations with their properties and relationships developed by the use of assumptions and a system of logic.

B. A number system also requires language. This language involves symbols for numerals, for operations, and for relations.
Ex. △ + ① = Z

C. When there is an element that acts like zero, this element is the additive identity.

D. Multiplication has an identity element.

IV. Vocabulary To Stress:

abstract number system finite

V. Activities:

A. Have the student make up his own abstract mathematical system.

* B. Attribute blocks could be used to illustrate or construct another system.

* C. Review clock arithmetic.

* D. Invent different symbols for 4-clock arithmetic.

* E. Build an addition table - first using numerals, then invented numerals.

Text References:

Book: 4

Houghton Mifflin (1967) pp. 334
Houghton Mifflin (1972) pp. 332

Book: 6

Houghton Mifflin (1972) pp. 332

* Suggested Introductory Activity

Level: 12 Step: Z Concept: Sets

WORKSHEET

The numerals for this number system are ⏢, ∫, ▯, ⌒, ☆.
Complete the addition and multiplication charts.

+	⏢	∫	▯	⌒	☆
⏢	⏢	∫	▯	⌒	
∫	∫	▯			
▯					
⌒					
☆					

×	⏢	∫	▯	⌒	☆
⏢	⏢	⏢	⏢	⏢	⏢
∫	⏢	∫	▯	⌒	☆
▯	⏢	▯	☆		⌒
⌒	⏢	⌒		☆	
☆	⏢	☆			∫

Level: 12 Step: Z Concept: Sets

WORKSHEET

The numerals for this number system are ∅ , ☆ , ▷ , ◎ , ☒ .
Complete the addition and multiplication charts.

+	∅	☆	▷	◎	☒
∅					
☆					
▷					
◎					
☒					

×	∅	☆	▷	◎	☒
∅					
☆					
▷					
◎					
☒					

12-48

Level: 12 Step: Z Concept: Sets

EVALUATION

The numerals for this number system are ⬡, △, ○, □, ♡.
Complete the addition and multiplication charts.

+	⬡	△	○	□	♡
⬡					
△					
○					
□					
♡					

×	⬡	△	○	□	♡
⬡					
△					
○					
□					
♡					

Level: 12 Step: Z Concept: Numeral

I. Concept:

Numeral: Comparing base three and four numeration system with base ten.

II. Behavioral Objective:

The student given a base three, four, or a base ten numeral will be able to write the numeral in the bases not given.

III. Mathematical Ideas:

A. Our system of numeration uses two major ideas: base and place.

B. The base of our system is ten, and objects to be counted are grouped in tens, ten-tens, and so on. In base four, objects to be counted would be grouped in fours, four-fours, and so on.

C. Each base system has as many digits as its name: base ten has 10 digits (0-9), base four has four digits (0-3), base three has three digits (0-2), etc.

D. The digits in any base-place system have three values: face, place, and total.

E. The notation for writing a base numeral is the subscript: 23_{four}, 201_{three}, 69_{ten}.

F. The numeral 23_{four} is read "two fours three" or "two groups of four and three ones."

IV. Vocabulary To Stress:

place value
face value
unit flat
multibase
total value
base
long cube
base ten
base four
base three

V. Activities:

Though this concept is limited, stress basic ideas of base numeration so they can do multibases.

* A. Use base four of the multibase blocks. Identify each size; i.e. single block = unit, one group of four = 1 long, one group of four-fours (16) = 1 flat, one group of four-four-fours (64) = 1 cube. When grouping in tens a group of ten ones is always exchanged for one ten, ten-tens for one hundred, and so on. When grouping in fours, four units are exchanged for one long, four longs for one flat and four flats for one cube. Thus:

5 units = 1 long, 1 unit
4 longs = 1 flat, 0 longs, 0 units
6 flats = 1 cube, 2 flats, 0 units

Every place value must be given.

Level: 12 Step: Z Concept: Numeral

V. Activities: continued

* B. Use E.S.A. Multibase Arithmetic Blocks cards 1-5. Student can use these independently. Do them once with each base.

Text References:

Book: 5

Houghton Mifflin (1972) pp. 10-13

* Suggested Introductory Activity

Level: 12 Step: Z Concept: Numeral

WORKSHEET

Directions: Complete the following equations. Use multibase three blocks to prove your answer.

1. □ □ = _______ units

2. □ □ □ = _______ units or _______ long

3. □ □ □ □ □ = _______ longs, _______ units

4. □□□ □□□ = _______ longs, _______ units

5. □□□ □ □ = _______ long, _______ units.

6. □ □ □ □ □ □ □ □ = _______ longs, _______ units

7. □□□ □□□ □□□ = _______ longs or _______ cube

8. □□□ □ □ □ □ □ = _______ longs, _______ units

9. □ □ □ □ □ □□□ = _______ longs, _______ units

10. □□□ □ □ □ □ □□□ = _______ longs, _______ units

Draw examples of the following:

11. 2 units = ____________________

12. 1 long, 1 unit = ____________________

13. 1 long, 2 units = ____________________

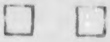
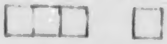
14. 2 longs, 0 units = ____________________

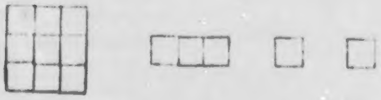
15. 1 flat, 2 longs, 2 units = ____________________

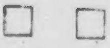
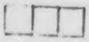
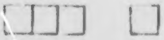
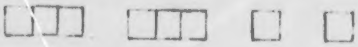
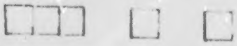
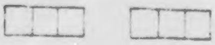
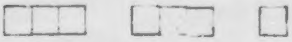
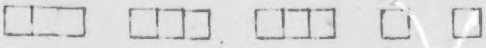
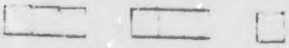
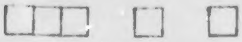
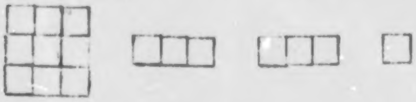
Level: 12 **Step:** Z **Concept:** Numeral

WORKSHEET

Directions: Write the notations in base three for the following: Use multibase three blocks to determine your answers.

Ex.  = 2_{three}  = 11_{three}

 = 112_{three}

1.  = __________
2.  = __________
3.  = __________
4.  = __________
5.  = __________
6.  = __________
7.  = __________
8.  = __________
9.  = __________
10.  = __________
11.  = __________
12. 2 units = __________
13. 2 longs, 2 units = __________
14. 2 longs = __________
15. 2 longs, 1 unit = __________
16. 1 flat, 2 longs, 1 unit = __________
17. two threes = __________
18. two three-threes, one three, one = __________
19. one three-three, two threes, two = __________
20. two three-threes, two = __________

Level: 12 Step: Z Concept: Numeral

WORKSHEET

Directions: Complete the following equations. Use multibase four blocks to prove your answer.

1. □ □ □ = ______ units

2. □ □ □ □ = ______ units or ______ long

3. □ □ □ □ □ □ = ______ longs, ______ units

4. □ □ □ □ □ □ □ □ = ______ longs, ______ units

5. □□□□ □ □ = ______ long, ______ units

6. □□□□ □□□□ = ______ longs, ______ units

7. □□□□ □□□□ □□□□ □□□□ = ______ longs or ______ cube

8. □□□□ □ □ □ □ □ = ______ longs, ______ units

9. □ □ □ □ □ □ □□□□ = ______ longs, ______ units

10. □□□□ □ □ □ □ □□□□ = ______ longs, ______ units

Draw examples of the following:

11. 2 units = ______________________________

12. 1 long, 1 unit = ______________________________

13. 1 long, 3 units = ______________________________

14. 2 longs, 0 units = ______________________________

15. 2 longs, 2 units = ______________________________

16. 3 longs, 1 unit = ______________________________

17. 1 long, 2 units = ______________________________

18. 2 longs, 1 unit = ______________________________

19. 3 longs, 0 units = ______________________________

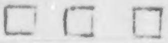
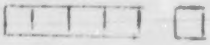
20. 2 longs, 3 units = ______________________________

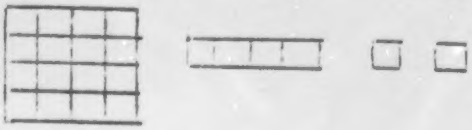
12-54

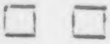
Level: 12 Step: Z Concept: Numeral

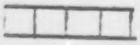
WORKSHEET

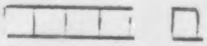
Directions: Write the notations in base four for the following: Use multibase four blocks to determine your answers.

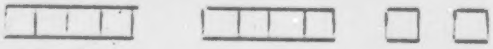
Ex.  = 3_{four}  = 11_{four}

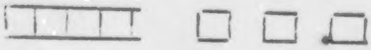
 = 112_{four}

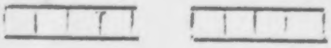
1.  = ________

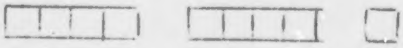
2.  = ________

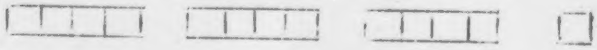
3.  = ________

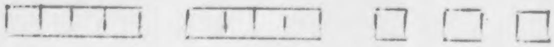
4.  = ________

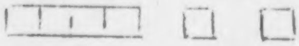
5.  = ________

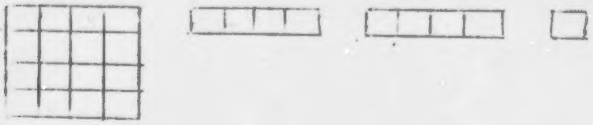
6.  = ________

7.  = ________

8.  = ________

9.  = ________

10.  = ________

11.  = ________

12. 3 units = ________

13. 2 longs, 2 units = ________

14. 2 longs = ________

15. 3 longs, 1 unit = ________

16. two fours one = ________

17. three fours three = ________

18. two four-fours two = ________

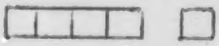
19. three four-fours one four one = ________

20. one four = ________

Level: 12 Step: Z Concept: Numeral

WORKSHEET

Rewrite these base ten numerals with drawings and notations in base four.
Use multibase blocks to determine answer.

Ex. 5_{ten} =  = 11_{four}

1. 7_{ten} = ______________________ = __________

2. 10_{ten} = ______________________ = __________

3. 12_{ten} = ______________________ = __________

4. 15_{ten} = ______________________ = __________

5. 9_{ten} = ______________________ = __________

6. 2_{ten} = ______________________ = __________

7. 11_{ten} = ______________________ = __________

8. 16_{ten} = ______________________ = __________

9. 18_{ten} = ______________________ = __________

10. 20_{ten} = ______________________ = __________

Level: 12 Step: Z Concept: Numeral

WORKSHEET

Rewrite these numerals in base four. You may use multibase blocks to determine your answer.

1. 8_{ten} = __________
2. 3_{ten} = __________
3. 7_{ten} = __________
4. 10_{ten} = __________
5. 1_{ten} = __________
6. 5_{ten} = __________
7. 9_{ten} = __________
8. 4_{ten} = __________
9. 2_{ten} = __________
10. 11_{ten} = __________
11. 15_{ten} = __________
12. 18_{ten} = __________
13. 13_{ten} = __________
14. 20_{ten} = __________
15. 16_{ten} = __________
16. 12_{ten} = __________
17. 14_{ten} = __________
18. 17_{ten} = __________
19. 22_{ten} = __________
20. 25_{ten} = __________

Rewrite these numerals in base ten.

21. 11_{four} = __________
22. 2_{four} = __________
23. 10_{four} = __________
24. 13_{four} = __________
25. 21_{four} = __________
26. 32_{four} = __________
27. 20_{four} = __________
28. 100_{four} = __________
29. 111_{four} = __________
30. 110_{four} = __________
31. 123_{four} = __________
32. 103_{four} = __________
33. 101_{four} = __________
34. 131_{four} = __________

Level: 12 Step: Z Concept: Numeral

WORKSHEET

Complete the following equations.

1. $23_{\text{four}} =$ __________ten

2. $30_{\text{four}} =$ __________ten

3. $2_{\text{four}} =$ __________ ten

4. $13_{\text{four}} =$ __________ten

5. $10_{\text{four}} =$ __________ten

6. $11_{\text{four}} =$ __________ten

7. $31_{\text{four}} =$ __________ten

8. $30_{\text{four}} =$ __________ten

9. $121_{\text{four}} =$ __________ten

10. $203_{\text{four}} =$ __________ten

11. $310_{\text{four}} =$ __________ten

12. $130_{\text{four}} =$ __________ten

13. $211_{\text{four}} =$ __________ten

14. $321_{\text{four}} =$ __________ten

15. $223_{\text{four}} =$ __________ten

16. $2_{\text{three}} =$ __________ten

17. $10_{\text{three}} =$ __________ten

18. $12_{\text{three}} =$ __________ten

19. $21_{\text{three}} =$ __________ten

20. $101_{\text{three}} =$ __________ten

21. $120_{\text{three}} =$ __________ten

22. $210_{\text{three}} =$ __________ten

23. $112_{\text{three}} =$ __________ten

24. $110_{\text{three}} =$ __________ten

25. $222_{\text{three}} =$ __________ten

12-58

Level: 12 **Step:** Z **Concept:** Numeral

WORKSHEET

Complete the following equations.

1. $4_{ten} =$ ________ $_{four}$

2. $12_{ten} =$ ________ $_{four}$

3. $7_{ten} =$ ________ $_{four}$

4. $5_{ten} =$ ________ $_{four}$

5. $25_{ten} =$ ________ $_{four}$

6. $28_{ten} =$ ________ $_{four}$

7. $43_{ten} =$ ________ $_{four}$

8. $52_{ten} =$ ________ $_{four}$

9. $37_{ten} =$ ________ $_{four}$

10. $59_{ten} =$ ________ $_{four}$

11. $12_{ten} =$ ________ $_{three}$

12. $14_{ten} =$ ________ $_{three}$

13. $7_{ten} =$ ________ $_{three}$

14. $3_{ten} =$ ________ $_{three}$

15. $5_{ten} =$ ________ $_{three}$

16. $10_{ten} =$ ________ $_{three}$

17. $21_{ten} =$ ________ $_{three}$

18. $26_{ten} =$ ________ $_{three}$

19. $16_{ten} =$ ________ $_{three}$

20. $6_{ten} =$ ________ $_{three}$

Level: 12 Step: Z Concept: Numeral

EVALUATION

Complete the following equations.

1. $11_{\text{four}} = \underline{\qquad\qquad}_{\text{ten}}$

2. $30_{\text{four}} = \underline{\qquad\qquad}_{\text{ten}}$

3. $121_{\text{four}} = \underline{\qquad\qquad}_{\text{ten}}$

4. $130_{\text{four}} = \underline{\qquad\qquad}_{\text{ten}}$

5. $321_{\text{four}} = \underline{\qquad\qquad}_{\text{ten}}$

6. $12_{\text{three}} = \underline{\qquad\qquad}_{\text{ten}}$

7. $21_{\text{three}} = \underline{\qquad\qquad}_{\text{ten}}$

8. $120_{\text{three}} = \underline{\qquad\qquad}_{\text{ten}}$

9. $112_{\text{three}} = \underline{\qquad\qquad}_{\text{ten}}$

10. $101_{\text{three}} = \underline{\qquad\qquad}_{\text{ten}}$

11. $25_{\text{ten}} = \underline{\qquad\qquad}_{\text{four}}$

12. $7_{\text{ten}} = \underline{\qquad\qquad}_{\text{four}}$

13. $37_{\text{ten}} = \underline{\qquad\qquad}_{\text{four}}$

14. $5_{\text{ten}} = \underline{\qquad\qquad}_{\text{three}}$

15. $10_{\text{ten}} = \underline{\qquad\qquad}_{\text{three}}$

12-60

Level: 12 Step: Z Concept: Addition & Subtraction

I. Concept:

Addition & Subtraction: introducing clock numbers & clock arithmetic.

II. Behavioral Objective:

The student given a clock equation will be able to solve it.

III. Mathematical Ideas:

A. Clock arithmetic is a finite mathematical system.

B. Addition of clock arithmetic corresponds to a clockwise movement on a clock face.

C. Subtraction of clock arithmetic corresponds to counter-clockwise movements on the clock face.

D. Multiplication of clock numbers corresponds to successive addition of the same addend.

E. Any set of numbers may be used to establish clock arithmetic.

F. The members of the set of numbers used in a clock arithmetic do not include the number of the clock. A 7-clock would include the numbers 0, 1, 2, 3, 4, 5, 6. A 12-clock would include 0. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.

G. Clock numbers cannot be ordered. That is, given two numbers in the system we cannot tell which is greater and which is less.

H. Clock arithmetic does not have the zero property of multiplication.

V. Activities:

* A. Draw various types of clocks and make up verbal problems for each.

Text References:

Book: 4

Houghton Mifflin (1967) pp. 330, (78), 331-333
Houghton Mifflin (1972) pp. 326-329

Book: 5

Houghton Mifflin (1967) pp. 186-189
Houghton Mifflin (1972) pp. 178, 179, (46)
Addison-Wesley (1971, 1968) pp. 314-321

Level: 12 Step: Z Concept: Addition & Subtraction

Text References: continued

Book: 6

Houghton Mifflin (1967) pp. 188-189
Houghton Mifflin (1972) pp. 180-184
Addison-Wesley (1971, 1968) pp. 90

Other References:

Franklin Mathematics Series, Lyons Carnahan, Mathematics Around the Clock.

* Suggested Introductory Activity

12-62

Level: 12 Step: Z Concept: Addition & Subtraction

EVALUATION

Solve the following clock equations.

1. $4 + 7 \overset{12}{\equiv}$ __________

2. $7 + 6 \overset{12}{\equiv}$ __________

3. $8 + 1 \overset{12}{\equiv}$ __________

4. $3 - 5 \overset{12}{\equiv}$ __________

5. $6 - 9 \overset{12}{\equiv}$ __________

6. $2 - 11 \overset{12}{\equiv}$ __________

7. $10 + 10 \overset{12}{\equiv}$ __________

8. $2 \times 5 \overset{12}{\equiv}$ __________

9. $4 \times 5 \overset{12}{\equiv}$ __________

10. $7 \times 3 \overset{12}{\equiv}$ __________

11. $6 + 3 \overset{7}{\equiv}$ __________

12. $6 + 6 \overset{7}{\equiv}$ __________

13. $2 + 6 \overset{7}{\equiv}$ __________

14. $5 + 4 \overset{7}{\equiv}$ __________

15. $6 - 3 \overset{7}{\equiv}$ __________

16. $5 - 6 \overset{7}{\equiv}$ __________

17. $2 - 4 \overset{7}{\equiv}$ __________

18. $3 \times 6 \overset{7}{\equiv}$ __________

19. $4 \times 4 \overset{7}{\equiv}$ __________

20. $5 \times 2 \overset{7}{\equiv}$ __________

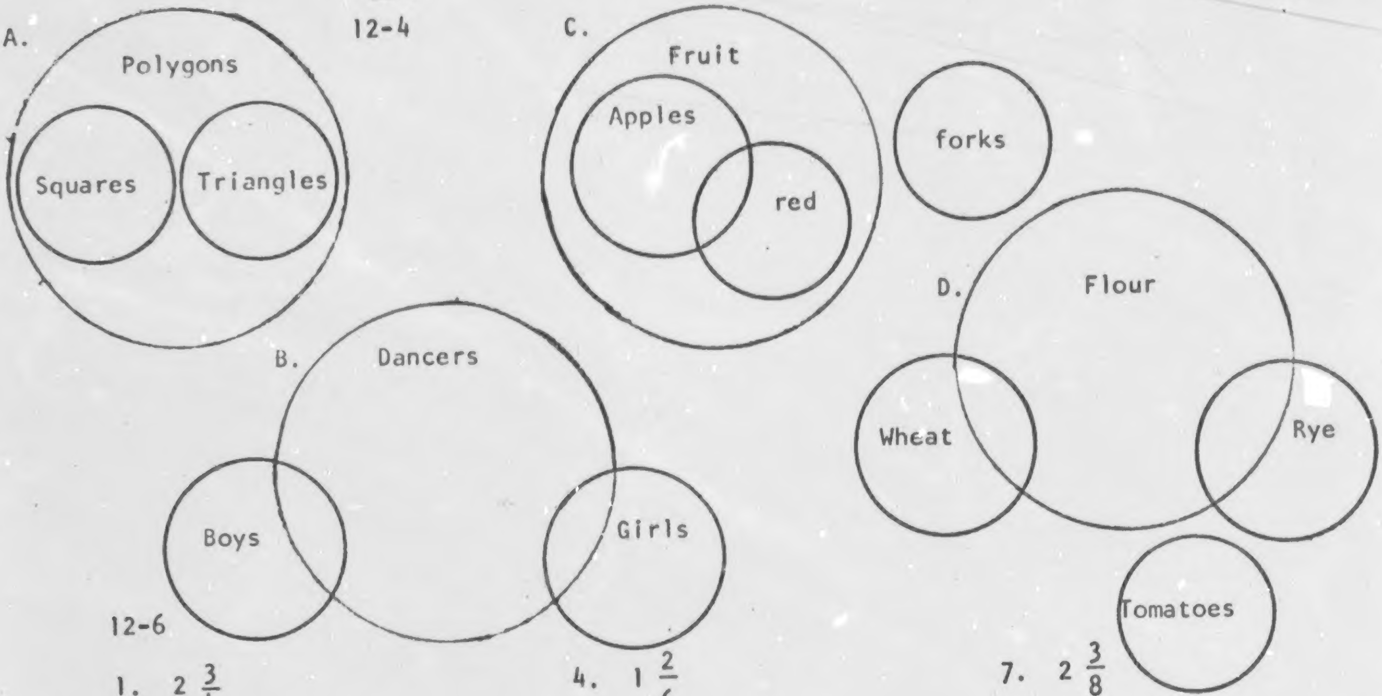
Level: 12

ANSWERS TO WORKSHEETS

12-3

1. T
2. F
3. F
4. T
5. T
6. T
7. F
8. T
9. T
10. F
11. F
12. T
13. F
14. F
15. T
16. T

12-4


A.
Polygons
Squares
Triangles
B.
Dancers
Boys
Girls
C.
Fruit
Apples
red
forks
D.
Flour
Wheat
Rye
Tomatoes

12-6

1. $2\frac{3}{4}$
2. $2\frac{1}{2}$
3. $3\frac{2}{5}$
4. $1\frac{2}{6}$
5. $2\frac{1}{2}$
6. $3\frac{1}{4}$
7. $2\frac{3}{8}$
8. $1\frac{5}{12}$

12-7

1. $1 + \frac{2}{6}$, $1\frac{2}{6}$
2. $1 + \frac{4}{7}$, $1\frac{4}{7}$
3. $1 + \frac{5}{8}$, $1\frac{5}{8}$
4. $1 + \frac{4}{5}$, $1\frac{4}{5}$
5. $1 + \frac{3}{9}$, $1\frac{3}{9}$
6. $4 + \frac{1}{2}$, $4\frac{1}{2}$
7. $\frac{28}{3}$
8. $\frac{38}{5}$
9. $\frac{19}{5}$
10. $\frac{38}{3}$
11. $\frac{9}{8}$
12. 3
13. $2\frac{1}{7}$
14. 2
15. $1\frac{4}{11}$
16. $1\frac{2}{8}$
17. $\frac{7}{5}$
18. $\frac{10}{7}$
19. $\frac{5}{2}$
20. $\frac{13}{8}$
21. $\frac{11}{9}$
22. $\frac{13}{6}$
23. $\frac{6}{4}$
24. $\frac{2}{9}$
25. $\frac{7}{10}$
26. $\frac{11}{12}$

Level: 12 ANSWERS TO WORKSHEETS: CONTINUED

12-10

1. >
2. <
3. >
4. >
5. <
6. >
7. >
8. >
9. <
10. =
11. =
12. >
13. =
14. <
15. <
16. =
17. <
18. =
19. >
20. >
21. =
22. =
23. <
24. >
25. =
26. >
27. =
28. =
29. >
30. =

12-11

1. <
2. >
3. >
4. =
5. <
6. >
7. <
8. <
9. <
10. >

12-14

1. 11,699
2. 7,406
3. 8,742
4. 7,436
5. 95,768
6. 84,286
7. 53,124
8. 28,073
9. 392,167
10. 570,188
11. 595,566
12. 604,982
13. 785,719
14. 440,940
15. 764,956
16. 897,204

12-17

1. 4,256
2. 127
3. 10,446
4. 1,447
5. 4,385
6. 81
7. 4,548
8. 1,039
9. 5,148
10. 1,310
11. 20,869
12. 1,128
13. 1,821
14. 122
15. 2,245
16. 18,784
17. 380,801
18. 340,695

12-19

1. 10,695
2. 22,890
3. 25,662
4. 16,055
5. 22,653
6. 51,224
7. 43,920
8. 51,508
9. 13,148
10. 30,680
11. 21,756
12. 15,984
13. $171.38
14. $186.30
15. $63.96
16. $520.30
17. $669.75
18. $513.52
19. $260.10
20. $312.96

Level: 12 ANSWERS TO WORKSHEETS: CONTINUED

12-22

1. 8 r 63
2. 7 r 13
3. 11 r 14
4. 3 r 19
5. 9 r 6
6. 6 r 2
7. 6
8. 2 r 85
9. 5 r 67
10. 7 r 20

12-25

1. 15, 23, 11, 21, 9
2. 19, 35, 11, 31, 7
3. 27, 51, 33, 45, 57
4. 44, 74, 54, 94, 84
5. 10, 13, 7, 12, 6
6. 11, 9, 6, 8, 5
7. 20, 36, 4, 52, 12
8. 5, 10, 4, 12, 9
9. 6, 11, 10, 7, 5
10. 8, 11, 3, 5, 10
11. $(m \times 3) + 1$
12. $(m \div 2) + 1$
13. $(m \times 5) - 2$
14. $(m \div 4) + 3$
15. $(m \times 4) - 2$

12-29

1. $3\frac{7}{8}$
2. $2\frac{3}{8}$
3. $4\frac{3}{8}$
4. $2\frac{5}{8}$
5. $3\frac{1}{8}$
6. $1\frac{7}{8}$
7. $5\frac{1}{8}$
8. $\frac{7}{8}$
9. $3\frac{5}{8}$
10. $2\frac{7}{8}$
11. $4\frac{1}{8}$
12. $1\frac{3}{8}$
13. $4\frac{1}{8}$
14. $3\frac{3}{8}$
15. $2\frac{1}{8}$

12-34

1. 3 × 3 × 3, 27
2. 4 × 4, 16
3. 5^2
4. 9 × 9 × 9, 729
5. 6^3
6. 12^2
7. 7^3
8. 2 × 2 × 2, 8
9. 3 × 3 × 3 × 3, 81
10. 5^4

12-35

1. 7 × 7, 49
2. 2^4, 16
3. 5 × 5 × 5, 125
4. 4^5, 1024
5. 8^2, 64
6. 7^4, 2401
7. 9 × 9, 81
8. 6^5, 7776
9. 2 × 2 × 2 × 2 × 2 × 2 × 2, 128
10. 4^7, 16,384
11. 20 × 20, 400
12. 11^3, 1331
13. 4 × 4 × 4 × 4, 256
14. 8 × 8 × 8, 512
15. 1×1×1×1×1×1×1×1, 1

12-37

1. Divide
2. Multiply
3. Subtract
4. Add
5. Multiply
6. Subtract

Level: 12 ANSWERS TO WORKSHEETS CONTINUED

12-38

1. $4.83
2. $2.75
3. $1.51
4. 13
5. 121
6. 24

12-41

A. 36
B. 18
C. 125
D. 10
E. 21
F. 21

12-43

1. 7
2. 4
3. 8
4. 12
5. 6
6. 10
7. 3
8. 11
9. 14
10. 12
11. 9
12. 15
13. 5
14. 13
15. 16

12-44

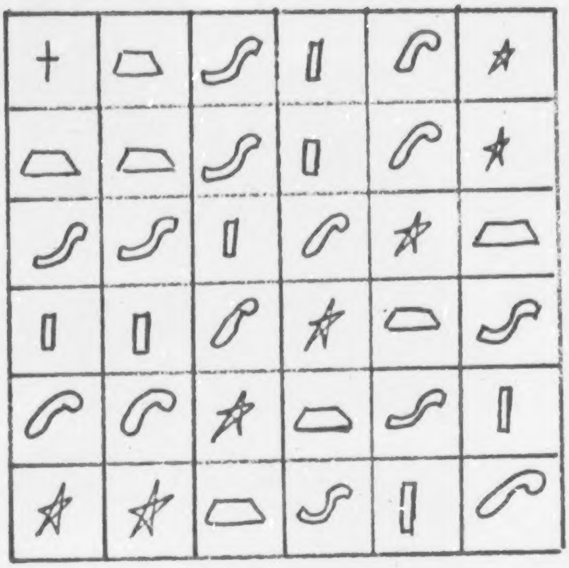
1. 4
2. 3
3. 9
4. 2
5. 6
6. 12
7. 5
8. 20
9. 11
10. 14

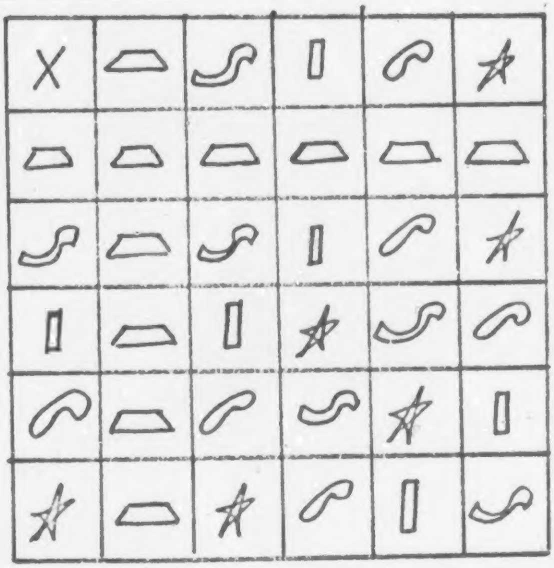
Level: 12

ANSWERS TO ENRICHMENT (STEP Z)

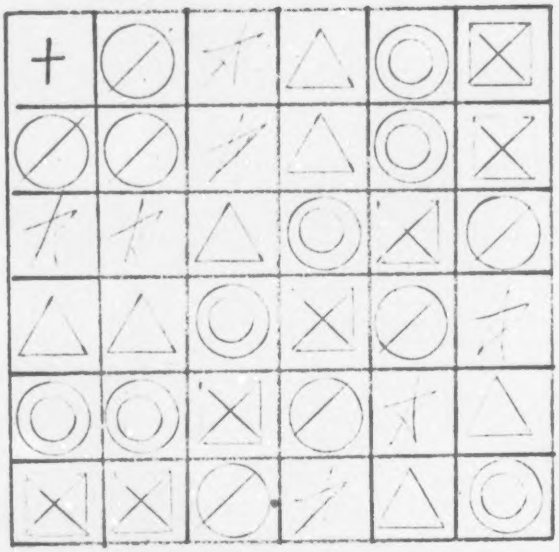
WORKSHEETS

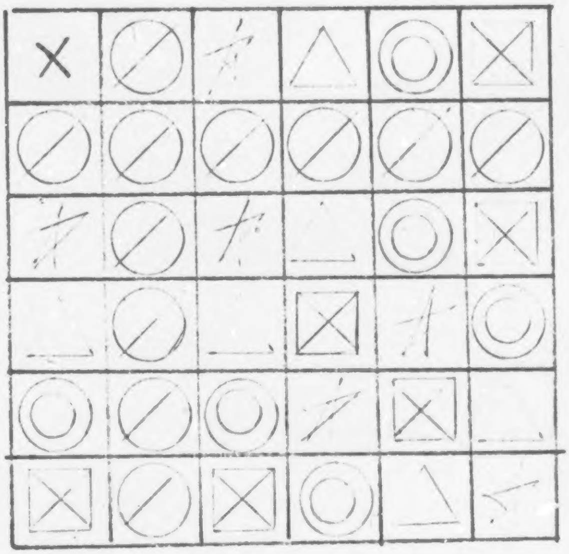
12-46





12-47





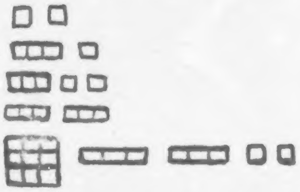
Level: 12

ANSWERS TO ENRICHMENT (STEP Z)

WORKSHEETS CONTINUED

12-51

1. 2
2. 3.1
3. 1,2
4. 2,0
5. 1,2
6. 2,2
7. 3,1
8. 2,2
9. 2,2
10. 3,1
11.
12.
13.
14.
15.

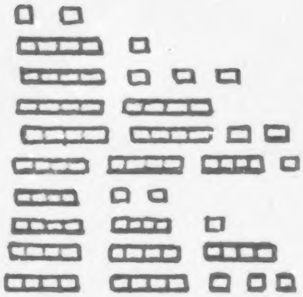


12-52

1. 2_{three}
2. 10_{three}
3. 11_{three}
4. 22_{three}
5. 12_{three}
6. 20_{three}
7. 21_{three}
8. 32_{three}
9. 21_{three}
10. 12_{three}
11. 121_{three}
12. 2_{three}
13. 22_{three}
14. 20_{three}
15. 21_{three}
16. 121_{three}
17. 20_{three}
18. 211_{three}
19. 122_{three}
20. 202_{three}

12-53

1. 3
2. 4,1
3. 1.2
4. 2,0
5. 1,2
6. 2,0
7. 4,1
8. 2,1
9. 2,2
10. 3
11.
12.
13.
14.
15.
16.
17.
18.
19.
20.



12-54

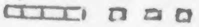
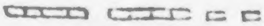
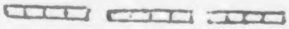
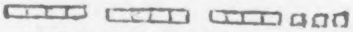
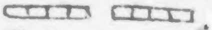
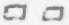
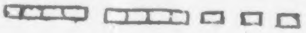
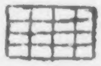
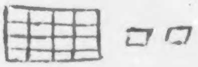
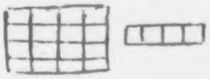
1. 2_{four}
2. 10_{four}
3. 11_{four}
4. 22_{four}
5. 13_{four}
6. 20_{four}
7. 21_{four}
8. 32_{four}
9. 23_{four}
10. 12_{four}
11. 121_{four}
12. 3_{four}
13. 22_{four}
14. 20_{four}
15. 31_{four}
16. 21_{four}
17. 33_{four}
18. 202_{four}
19. 311_{four}
20. 100_{four}

Level: 12

ANSWERS TO ENRICHMENT (STEP Z)

WORKSHEETS CONTINUED

12-55

1.  = 13_{four}
2.  = 22_{four}
3.  = 30_{four}
4.  = 33_{four}
5.  = 21_{four}
6.  = 2_{four}
7.  = 23_{four}
8.  = 100_{four}
9.  = 102_{four}
10.  = 110_{four}

12-56

1. 20_{four}
2. 3_{four}
3. 13_{four}
4. 22_{four}
5. 1_{four}
6. 11_{four}
7. 21_{four}
8. 10_{four}
9. 2_{four}
10. 23_{four}
11. 33_{four}
12. 102_{four}
13. 31_{four}
14. 110_{four}
15. 100_{four}
16. 30_{four}
17. 32_{four}
18. 101_{four}
19. 110_{four}
20. 121_{four}
21. 5_{ten}
22. 2_{ten}
23. 4_{ten}
24. 7_{ten}
25. 9_{ten}
26. 14_{ten}
27. 8_{ten}
28. 16_{ten}
29. 21_{ten}
30. 20_{ten}
31. 27_{ten}
32. 19_{ten}
33. 17_{ten}
34. 29_{ten}

12-57

1. 11
2. 12
3. 2
4. 7
5. 4
6. 5
7. 13
8. 12
9. 25
10. 35
11. 52
12. 28
13. 37
14. 59
15. 43
16. 2
17. 3
18. 5
19. 7
20. 10
21. 15
22. 21
23. 14
24. 12
25. 26

12-58

1. 10
2. 30
3. 13
4. 11
5. 121
6. 130
7. 223
8. 310
9. 211
10. 321
11. 110
12. 112
13. 21
14. 10
15. 12
16. 101
17. 210
18. 222
19. 121
20. 20

12-70

Level: 12

ANSWERS TO ENRICHMENT (STEP Z)

EVALUATION

12-48

+	⬡	△	○	□	♡
⬡	⬡	△	○	□	♡
△	△	○	□	♡	⬡
○	○	□	♡	⬡	△
□	□	♡	⬡	△	○
♡	♡	⬡	△	○	□

X	⬡	△	○	□	♡
⬡	⬡	⬡	⬡	⬡	⬡
△	⬡	△	○	□	♡
○	⬡	○	♡	△	□
□	⬡	□	△	♡	○
♡	⬡	♡	□	○	△

12-59

1. 5
2. 12
3. 25
4. 28
5. 58
6. 5
7. 7
8. 150
9. 14
10. 10
11. 121
12. 13
13. 211
14. 12
15. 101

12-62

1. 11
2. 1
3. 7
4. 10
5. 9
6. 1
7. 2
8. 10
9. 8
10. 9
11. 2
12. 5
13. 1
14. 2
15. 4
16. 6
17. 5
18. 4
19. 2
20. 3

Level: 12

Answer Sheet - Post Test I

Step A

Sets

1. True
2. True
3. False
4. True
5. False

Numeral

6. $1\frac{1}{6}$
7. $1\frac{5}{8}$
8. $2\frac{1}{9}$
9. $\frac{9}{6}$
10. $\frac{24}{10}$

Order

11. =
12. >
13. <
14. =
15. <

Addition

16. 795,460
17. 89,767
18. 8,435
19. 103,788
20. 5,893

Subtraction

21. 401,864
22. 28,606
23. 29,087
24. 5,558
25. 3,318

Multiplication

26. 8,334
27. 23,322
28. 6,232
29. 7,685
30. 12,492

Division

31. 12 R 1
32. 12 R 15
33. 13 R 22
34. 11 R 50
35. 14 R 14

Functions

36. {19,7,13,10}
37. {6,9,5,3}
38. {9,15,7,13}
39. {6,5,7,12}
40. {17,32,22,27}

Geometry

41. e
42. a
43. d
44. b
45. d

Measurement

46. $1\frac{5}{8}$
47. $\frac{7}{8}$
48. $2\frac{1}{8}$
49. $2\frac{3}{8}$
50. $1\frac{7}{8}$

Step B

Sets

51. False
52. True
53. False
54. True
55. True

Numeral

56. 9x9x9x9
57. 3^3
58. 5x5x5x5x5x5
59. 1,024
60. 7x7x7

Add., Subt., Mult., Div.

61. +, -
62. 4
63. x, +
64. 685
65. x, -
66. ice cream bars, 5 cents
67. +, -
68. 26
69. x, +
70. $18.25
71. +, ÷
72. 19
73. +, -
74. 5
75. x, -
76. 13
77. +, -
78, 170
79. +, -
80. 15

Geometry

81. 8
82. 24
83. 48
84. 45
85. 216

Measurement

86. 9
87. 11
88. 5
89. 8
90. 3

12-72

Level: 12 Answer Sheet - Post Test II

Step A

Sets

1. True
2. False
3. False
4. False
5. True

Numeral

6. $1\frac{3}{10}$
7. $2\frac{4}{5}$
8. $1\frac{2}{4}$
9. $\frac{12}{9}$
10. $\frac{5}{3}$

Order

11. >
12. >
13. <
14. <
15. =

Addition

16. 7,499
17. 81,476
18. 6,444
19. 669,636
20. 88,794

Subtraction

21. 2,565
22. 31,535
23. 3,751
24. 566,861
25. 47,864

Multiplication

26. 6,850
27. 6,570
28. 19,142
29. 14,220
30. 6,162

Division

31. 23 R 10
32. 25 R 8
33. 18 R 12
34. 26 R 3
35. 17 R 5

Functions

36. {13,7,11,17}
37. {4,6,5,7}
38. {7,11,9,5}
39. {13,28,8,23}
40. {3,6,4,2}

Geometry

41. pyramid
42. cone
43. cylinder
44. cylinder
45. pyramid

Measurement

46. $1\frac{5}{8}$
47. $\frac{7}{8}$
48. $1\frac{3}{8}$
49. $2\frac{1}{8}$
50. $1\frac{1}{8}$

Step B

Sets

51. True
52. True
53. False
54. False
55. True

Numeral

56. 2x2x2
57. 81
58. 5^2
59. 6x6x6x6x6
60. 10^4

Add., Subt., Mult., Div.

61. x, ÷
62. 4
63. x, ÷
64. 3
65. +, ÷
66. $733
67. x, ÷
68. 164
69. ÷, ÷
70. 5
71. +, ÷
72. 635
73. +, ÷
74. $80.00
75. +, ÷
76. 90
77. +, ÷
78. 12
79. +, -
80. 3

Geometry

81. 72
82. 8
83. 180
84. 30
85. 48

Measurement

86. 10
87. 6
88. 9
89. 7
90. 12

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Level: 13 Step: A Concept: Sets

I. Concept:

Sets: Naming the least common multiple of two numerals by the intersection of the sets of their multiples.

II. Behavioral Objective:

The student given two numerals will be able to identify the LCM by using the intersection of the sets of multiples.

III. Mathematical ideas:

A. Any number has a set of multiples.

B. The intersection of sets of multiples will be common multiples.

C. The smallest member of the intersection is the LCM.

D. Since zero is a multiple of every number, it is eliminated when naming the least common multiple.

IV. Vocabulary to Stress: intersection - common - multiple

V. Activities:

A. Teacher's Edition, Imperial Tapes (Intermediate), 2 activities for LCM, lesson 17.

Text References:

Book: 4 Houghton Mifflin (1972) pp 162-163

Book: 5

Houghton Mifflin (1967) pp. 168-171, (43)
Houghton Mifflin (1972) pp. 164
Addison-Wesley (1971, 1968) pp. 170-171,238

Book: 6

Houghton Mifflin (1967) pp. 174-175, (39)
Houghton Mifflin (1972) pp. 168, 170
Addison-Wesley (1971,1968) pp. 88-89

Book: 7

Houghton Mifflin (1967) pp. 241-245, (37)
Houghton Mifflin (1972) pp. 165, 192, 228, 421
Addison-Wesley (1971) pp. 181-183, 218-219

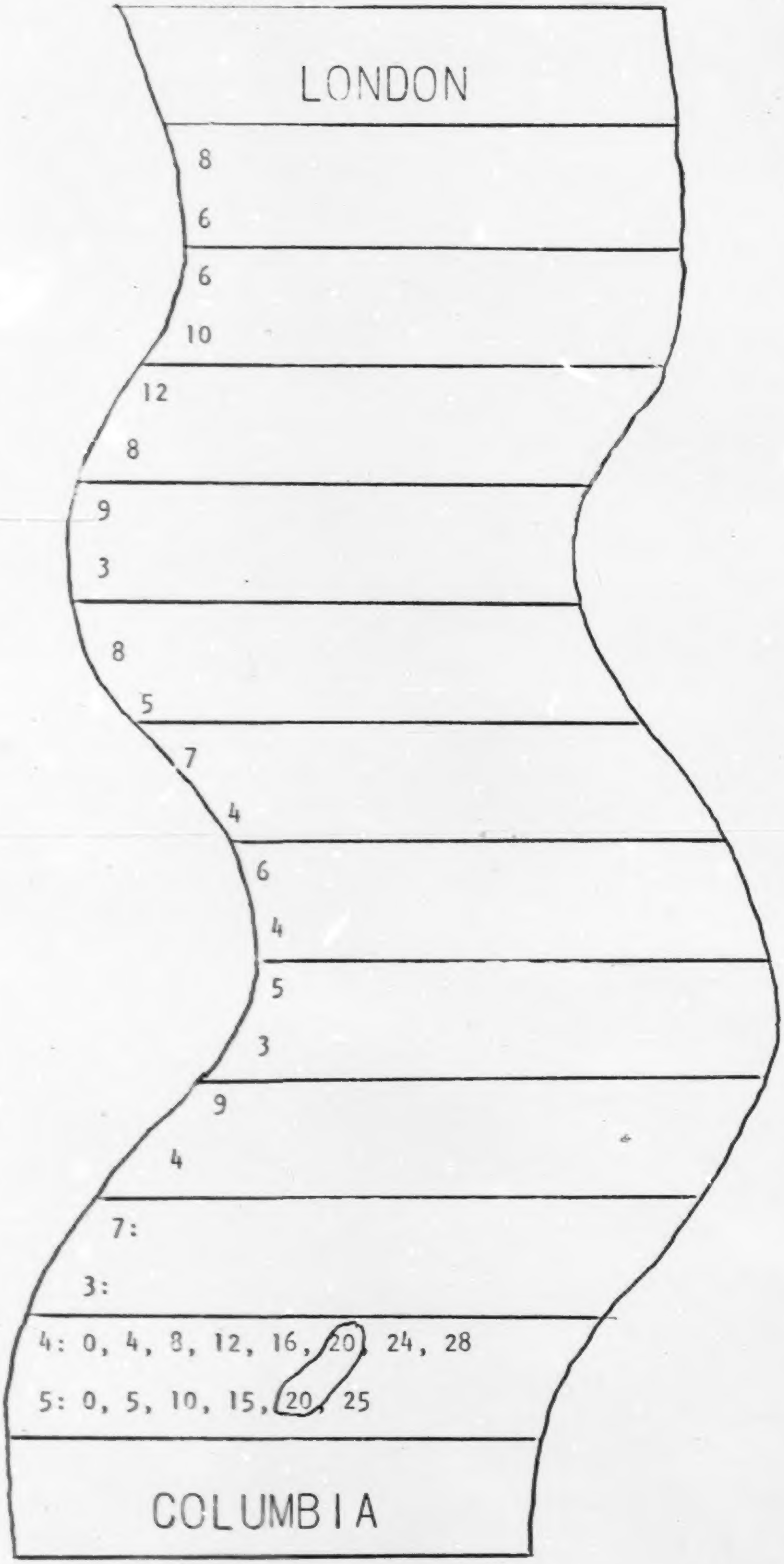
Other References:

Imperial Tape #17, (Intermediate)
Modern Math Filmstrip #761

13-2

Level: 13
Step: A

WORKSHEET: SETS
TAKE A TRIP TO LONDON



8
6

6
10

12
8

9
3

8
5

7
4

6
4

5
3

9
4

7:
3:

EXAMPLE:
4: 0, 4, 8, 12, 16, 20, 24, 28
5: 0, 5, 10, 15, 20, 25

LIST MULTIPLES LESS THAN 50 OF THE NUMBERS IN EACH BOX. THEN CIRCLE THE LCM.

Level: 13 Step: A Concept: Addition

I. Concept:

Addition: Renaming fractional numbers with unlike denominators using the LCM and adding to find the sum.

II. Behavioral Objective:

The student given fractional numbers with unlike denominators will be able to rename them as a sum in simplest form.

III. Mathematical Ideas:

A. Fractions greater than 1 may be renamed as mixed numerals.
B. Unlike fractions may be renamed as equivalent fractions.

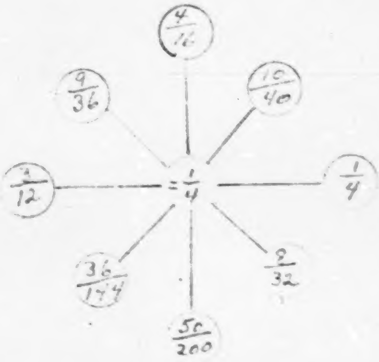
IV. Vocabulary to Stress: denominator - numerator - least common multiple (LCM)

V. Activities:

A. To help in naming equivalents the child or the teacher can make:

1. Fraction string: $\frac{4}{\Box} = \frac{\Box}{36} = \frac{6}{\Box} = \frac{1}{3} = \frac{5}{\Box} = \frac{17}{51}$

2. Fraction star: This fraction star can also be applied to subtraction of fractions.



B. Use flannel board with felt fractional parts.

C. Bowling. Teacher will need 10 paper towel rolls and a small rubber ball. On each cardboard tube write a fraction or write a fraction on paper and paper clip it on the tube. Set the tubes in the form of bowling pins. Each child should roll the ball from a previously determined line. The fractions on the pins knocked over are put on the board and the child must add these. If he does this correctly he gets a point for each pin knocked over. The teacher could teach how to score in bowling. In order to score he must first add correctly.

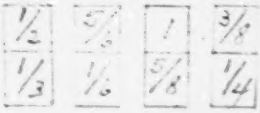
Level: 13 Step: A Concept: Addition

V. Activities: (continued)

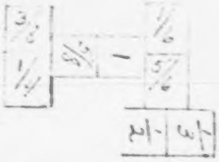
D. Addition of fractions. Cut several flash cards from tagboard, cardboard, etc. On these cards write 2 or more unlike fractions. The teacher shows the card to the class. Each child writes the lowest common denominator on his paper. He should number his paper for as many flash cards as the teacher has. The teacher shows all of the flash cards with the children each writing the LCD on their papers.

E. Eraser Toss. Find an old muffin pan. In the bottom of each cup write a fraction with magic marker. Have the children stand behind a chalk mark line. They can toss an eraser into the muffin pan. The score the child earns is the value of the fraction of the cup in which his eraser lands. The child must keep track of his score. He gets one turn each round. He writes down his number and adds it to his previous score each time.

F. Fraction Dominoes. Make fraction dominoes, as:



The game is to place each domino so that a sum touches 2 addends, as:



Text References:

Book: 4

Houghton Mifflin (1967) pp. 308, 311
Houghton Mifflin (1972) pp. 282, 283

Book: 5

Houghton Mifflin (1967) pp. 237-239, (60, 61), 242-244, (62), 245-247, (63)
Houghton Mifflin (1972) pp. 148-151, 196-203 (Addition and Subtraction)
Addison-Wesley (1971, 1968) pp. 232-233, 240-241, 245, 247-249

Book: 6

Houghton Mifflin (1967) pp. 216-217, (48), 218-221, 230 (part)
Houghton Mifflin (1972) pp. 192-197, (48), 347
Addison-Wesley (1971, 1968) pp. 140-144, (27), 145, 148-152, (28), 153

Level: 13 Step: A Concept: Addition

Book: 7

Houghton Mifflin (1967) pp. 341-345, (51)
Houghton Mifflin (1972) pp. 156, 191, 422, 336-349, (52, 57)
Addison-Wesley (1971) pp. 216-221, (42)

Other References:

Imperial Tape #19 (Intermediate) to introduce equivalent fractions
Imperial Tape #20 (Intermediate)
Modern Math Filmstrip #762
Modern Math Filmstrip #756
Modern Math Filmstrip #758

Level: 13 Step: A Concept: Subtraction

I. Concept:

Subtraction: Naming the missing addend of fractional numbers with with unlike denominators using the LCM.

II. Behavioral Objective:

The student given a sum and one addend in fractional numbers with unlike denominators will be able to name the missing addend using the least common multiple.

III. Mathematical Ideas:

A. Equivalent fractions name the same fractional numbers.

B. A missing addend can be found if the sum and one addend are given.

C. Fractions with unlike denominators may be subtracted, first renaming the fractions as equivalent fractions with the same denominators.

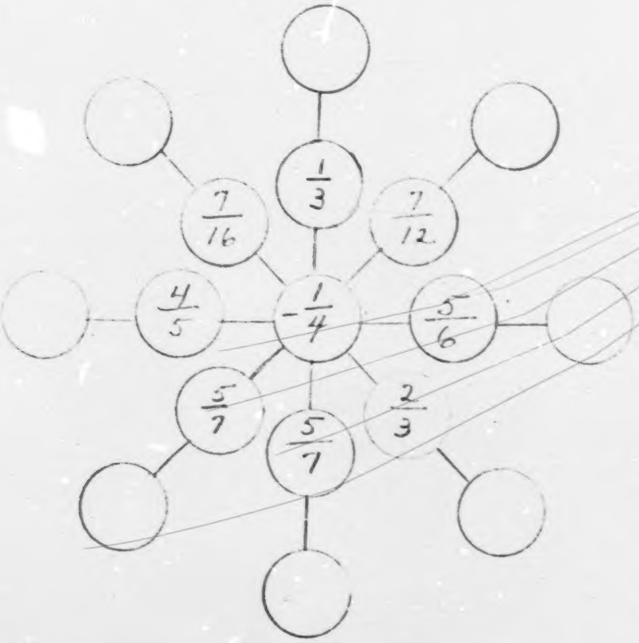
IV. Vocabulary to Stress: equivalent - addend - least common multiple-(LCD)

V. Activities:

A. Teachers edition Imperial Tape #21 (Intermediate)

B. Use flannel board to demonstrate subtracting fractional numbers.

C. Fraction star.

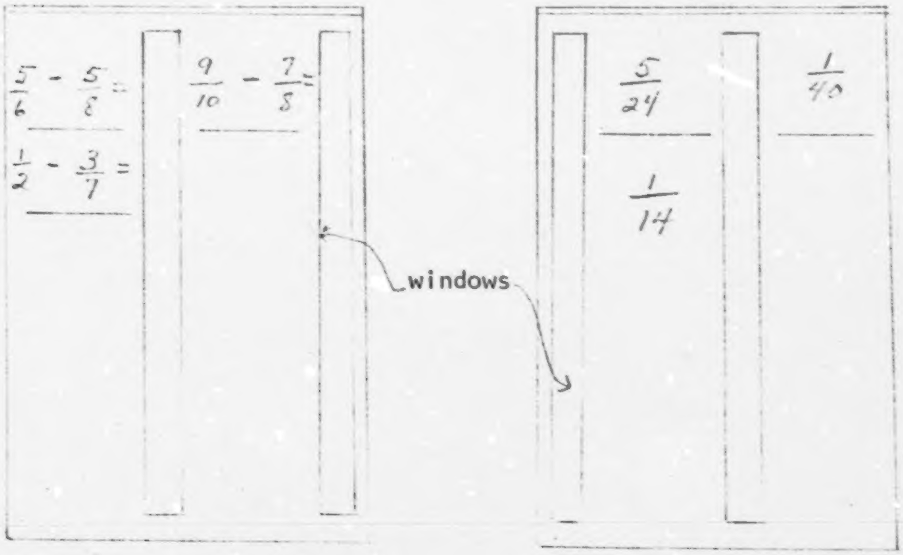


Level: 13 Step: A Concept: Subtraction

V. Activities: (continued)

D. See multiplication of fractions. These games can be used here.

E. Cut pieces of tagboard as shown below. Leave windows in the tagboard so that the child may put notebook paper underneath and write on his paper. He simply turns to the reverse side to check his work.


$\frac{5}{6} - \frac{5}{8} =$
$\frac{9}{10} - \frac{7}{8} =$
$\frac{1}{2} - \frac{3}{7} =$
windows
$\frac{5}{24}$
$\frac{1}{40}$
$\frac{1}{14}$

Front
Shows Problems

Reverse
Shows Answers

Text References:

Book: 4

Houghton Mifflin (1967) pp. 308, 311

Book: 5

Houghton Mifflin (1967) pp. 237-239, (60), 247-251, (63, 64), 256-257, (65), 327
Houghton Mifflin (1972) pp. 194-202, 209-213
Addison-Wesley (1971, 1968) pp. 230-231, 234-235, 239, 250, (47), 251, (48), 254-255, 337

Level: 13 Step: A Concept: Subtraction

Book: 6

Houghton Mifflin (1972) pp. 192-193, (part) 346
Houghton Mifflin (1967) pp. 222-223, (49), 224-225, 230
Addison-Wesley (1971, 1968) pp. 162

Book: 7

Houghton Mifflin (1967) pp. 336-349, (51), 341-345, (51)
Houghton Mifflin (1972) pp. 156, 191, 422
Addison-Wesley (1971) pp. 216-220

Other References:

Imperial Tape #21 (Intermediate) (part)

Level: 13 Step: A Concept: Division

I. Concept:

Division: Naming the quotient using a four digit dividend with a two digit divisor.

II. Behavioral Objective.

The student given a four digit dividend and a two digit divisor will be able to name the quotient.

III. Mathematical Ideas:

A. Division is repeated subtraction of the same addend.

B. Division is the inverse operation of multiplication. Multiply to check work.

IV. Activities:

A. Division Steps Game. Place two long division examples on the board and choose two teams. The first pupil goes to the board and divides, subtracts, etc. If a pupil notices a mistake in his team's work he may work the example through from the start. The first team to finish an example correctly wins.

B. Olympics. Teams can be rows of children at their desks, each numbered. Leader calls for a certain number from each row to go to the board and gives a problem in long division. The person finishing first goes to his seat and sits down. If the problem is done correctly he wins one point for his row and his row gets the gold medal, (made of gold foil or yellow construction paper.) If the winning team already has the trophy, they get an additional 5 points and his row keeps the medal for another round. Scores are tallied by rows. The pupils at their desks also do the problems and the first four to stand with the right answer also win a point for their team.

C. Golf. While pupils lay their heads on desks, with eyes closed, the teacher (or leader) writes a story problem on the board. At the signal "Go" all look up, read the problem, and begin to work. As each pupil finishes he raises his hand. The leader (or teacher) gives the first person to finish 1 point; the second 2 points; and so on. Points count as "strokes" taken to make the first hole. Each pupil records his score at the left side of his paper. Those who cannot finish the problem in a reasonable time are given an arbitrary number of strokes. The problem is then worked by a pupil at the board. Those who had incorrect answers must add as many strokes to their scores as were given to those who did not finish. Nine holes constitute a "round". The player with the lowest score wins.

Level: 13 Step: A Concept: Division

Text References:

Book: 4

Houghton Mifflin (1967) pp. 326-329
Houghton Mifflin (1972) pp. 343 (part), 222, 227, 230 (part)

Book: 5

Houghton Mifflin (1967) pp. 127-128, 322, (38)
Houghton Mifflin (1972) pp. 181-185, 343
Addison-Wesley (1971, 1968) pp. 56-57, 121-125, 128-129, 130, 133-134, 142, 144, 146-149, 158, 333, 334, (8, 9, 32, 33).

Book: 6

Houghton Mifflin (1967) pp. 56-59, (12) 111, 112, 113 (25)
Houghton Mifflin (1972) pp. 82-84, (22), 340
Addison-Wesley (1971, 1968) pp. 56, 326 (Set 15)

Book: 7

Houghton Mifflin (1967) pp. 157-158, (25)
Houghton Mifflin (1972) pp. 81-82, 417
Addison-Wesley (1971) pp. 65-66, (15, 16)

Other References:

Imperial Tape #13, (Intermediate)
Modern Math Filmstrip #750
Modern Math Filmstrip #744

Level: 13 Step: A Concept: Geometry

I. Concept:

Geometry: Identifying pentagons and hexagons.

II. Behavioral Objective:

The student given several examples of special polygons will be able to identify pentagons and hexagons.

III. Mathematical Ideas:

A. A pentagon is a simple closed curve formed by the union of 5 line segments.

B. A hexagon is a simple closed curve formed by the union of 6 line segments.

IV. Vocabulary to Stress: pentagon - hexagon - vertices - polygon

V. Activities:

A. Have a cardboard pentagon and hexagon to display. Let children count sides.

B. Have the children construct several different polygons to compare, label, and then put on a bulletin board.

C. Construct a geoboard. See Paper & Pencil Geometry, page 43.

D. Make chart for room showing meaning of "penta"-, "quad"-, "hexa"-, "poly", "tri"

Text References:

Book: 5

Houghton Mifflin (1967) pp. 65, (18)
Houghton Mifflin (1972) pp. 108 (29) (part)
Addison-Wesley (1971, 1968) pp. 346- enrichment

Book: 6

Houghton Mifflin (1967) pp. 74, 84
Houghton Mifflin (1972) pp. 95
Addison-Wesley (1971, 1968) pp. 345

Level: 13 Step: A Concept: Geometry

Boo

Book: 7

Houghton Mifflin (1967) pp. 413

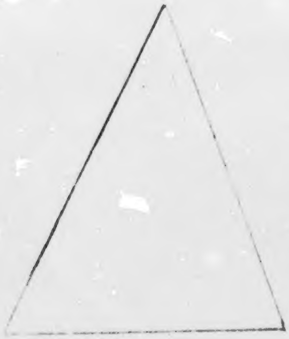
Other References:

1. Franklin Series, Paper and Pencil Geometry, p. 43.
2. Franklin Series, Patterns and Puzzles in Mathematics, p. 58.
3. Mathematics in the Making 1, Pattern, Area, and Perimeter.
4. Mathematics in the Making 3, Looking at Solids, pp. 1-9.
5. Mathematics in the Making 4, Rotation and Angles, pp. 23-24.
6. Curriculum Filmstrip #367 (order from IMC)
7. Modern Math Filmstrip #752
8. Modern Math Filmstrip #755
9. Forms We See (Filmstrip and Tape) #EFH06-4 Polygons

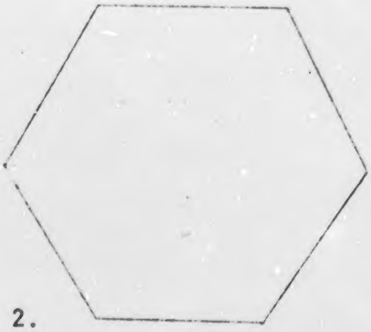
WORKSHEET

Level: 13 -- Step: A

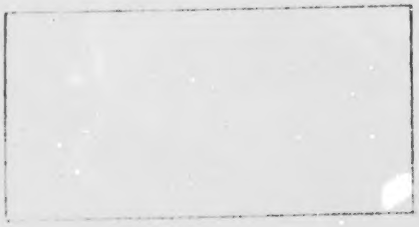
1.



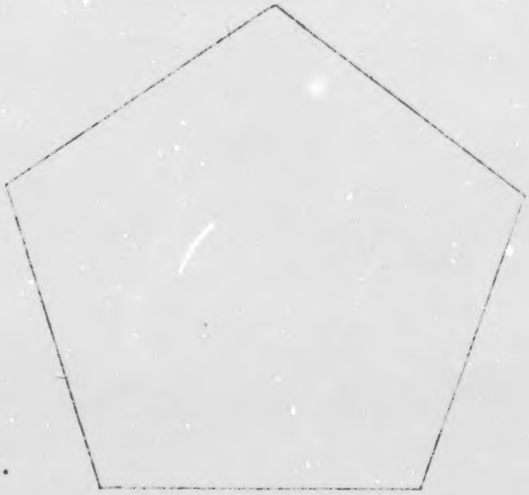
2.



3.



4.



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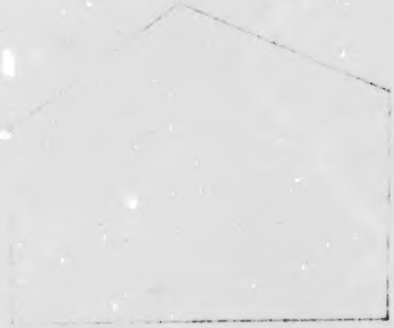
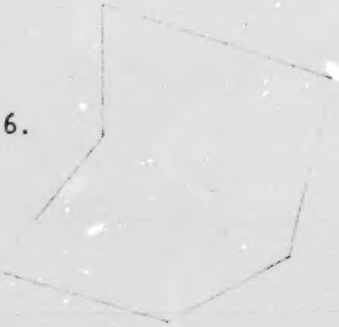
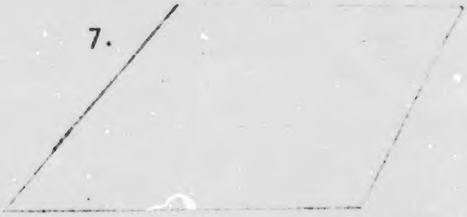


6.



7.



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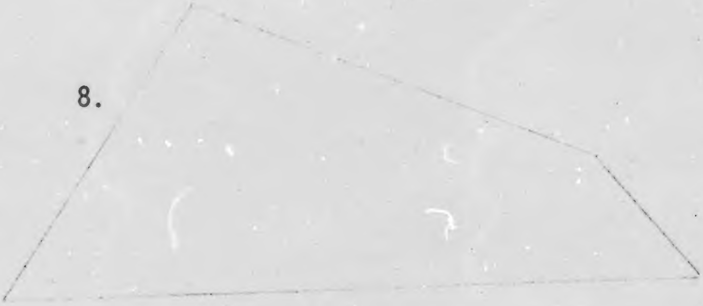

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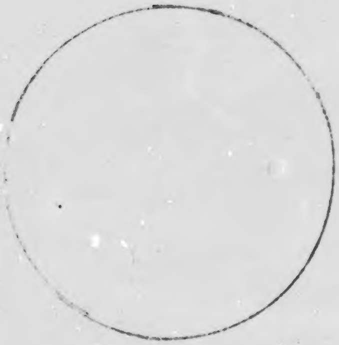


Which figures are pentagons?______________________________

Which figures are hexagons?______________________________

Level: 13 Step: A Concept: Measurement

Metric units of length: (mm, cm, decimeter, meter)

I. Concept:

Measurement: The students can use units of length within the metric system.

II. Behavioral Objective:

The student, given measures of length in the metric system, will be able to convert them to other measures in the metric system.

III. Mathematical Ideas:

A. Metric system is based on powers of 10.

B. A meter is a little more than a yard.

C. A centimeter is 1/100 of a meter.

D. A decimeter is 10 centimeters.

E. A millimeter is 1/1000 of a meter.

IV. Vocabulary to Stress: meter - millimeter - centimeter

V. Activities:

A. Find a decimeter on the meter stick.

B. How many meters do you walk from the classroom to the cafeteria?

C. Discuss "Did you Know?" (See next page)

Text References:

Book: 4

Houghton Mifflin (1972) pp. 324, 325

Book: 5

Houghton Mifflin (1967) pp. 26-27, 260
Houghton Mifflin (1972) pp. 94
Addison-Wesley (1971, 1968) pp. 83, 266-267, 347

Book: 6

Houghton Mifflin (1967) pp. 21, 289, 353, 27
Houghton Mifflin (1972) pp. 21, 289, 353
Addison-Wesley (1971, 1968) pp. 101

Level: 13 Step: A Concept: Measurement

Book: 7

Houghton Mifflin (1972) pp. 20-22
Addison-Wesley (1971) pp. 324-326

Other References:

Metric Measurement (Minneapolis Public Schools)
Introducing the Metric System
Arithmetic Teacher April 1973
Imperial Tape #37 (Intermediate) page 3

DID YOU KNOW?

A paper clip weighs approximately 1 gram.

A wire in a paper clip measures 1 millimeter in diameter.

A nickel weighs 5 grams.

A dime is 1 millimeter thick.

A cube of sugar weighs approximately 2 grams.

Eight common straight pins weigh approximately 1 gram.

1 meter is about the height or arm stretch of a kindergarten child.

A decimeter is about the length of a new piece of chalk.

1 centimeter is about the width of a finger.

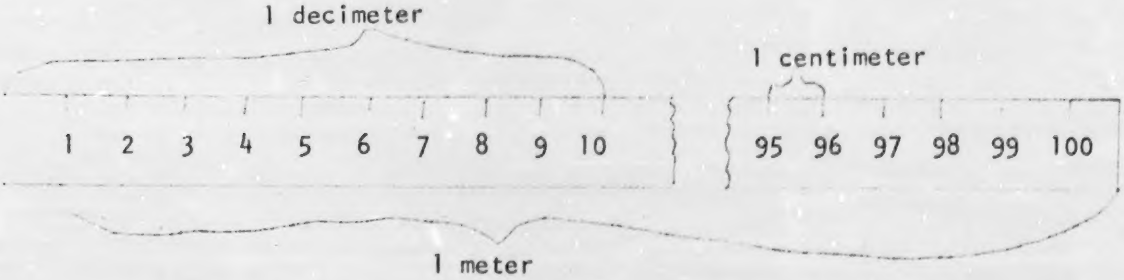
1 millimeter is the thickness of heavy tagboard.

----from The Arithmetic Teacher

April 1973

Level: 13 Step: A Concept: Measurement

Worksheet: Measurement


1 decimeter
1 centimeter
1
2
3
4
5
6
7
8
9
10
95
96
97
98
99
100
1 meter

1. ☐ millimeters = 1 centimeter.

2. 20 centimeters = ______ decimeters.

3. 34 centimeters = ______decimeters and______centimeters.

4. ______decimeters = 1 meter.

5. 10 meters = ______decimeters.

6. 10 decimeters = ______centimeters.

7

7. 30 decimeters = ______meters.

8. Centimeter means ☐ of a meter.

9. Kilometer means ☐ meters.

10. Decimeter means ☐ of a meter.

11. 20 centimeters equal ☐ decimeters.

Level: 13 Step: A Concept: Measurement

Worksheet: Measurement

Metric units of length: Read carefully. Think. Look at a ruler marked in centimeters.

A yard is 36 inches long.
A meter is about 39 inches long.
A centimeter is 1/100 of a meter.
A millimeter is 1/1000 of a meter.
A decimeter is 10 centimeters or 1/10 of a meter.
Ten decimeters equal a meter.
Meter means to measure.
1 meter = 10 decimeters.
1 decimeter = 10 centimeters.
1 centimeter = 10 millimeters.
1 kilometer = 1000 meters.

Use above facts.

1. How many decimeters does it take to equal a meter?

2. How many decimeters in 7 meters?

3. How many millimeters in a meter?

4. One meter is equal to centimeters.

5. How many millimeters does it take to equal the length of a centimeter?

6. An average city block is 80 meters long. That distance is equal to about how many decimeters?

7. Units smaller than a meter:

1000 millimeters (mm)
100 centimeters (cm) Meter
10 decimeters

8. 50 centimeters equal how many millimeters?

9. 50 meters equal centimeters.

10. A ruler 30 centimeters long would have millimeters?

Level: 13 Step: B Concept: Sets

I. Concept:

Sets: Naming the greatest common factor of two numerals by listing the factors, identifying the common ones and choosing the largest common factor.

II. Behavioral Objective:

The student given two or more numerals will be able to list the factors of each and identify the Greatest Common Factor.

III. Mathematical Ideas:

A. A number can be renamed as pairs of factors.

B. The intersection of the sets of factors will be the common factors.

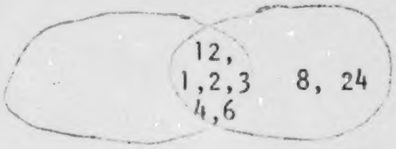
C. The largest factor in the intersection is the GCF.

IV. Vocabulary to Stress:

common	intersection
factor	Greatest Common Factor

V. Activities:

* A. What factors are in the intersection:
What is the Greatest Common Factor?



B. Have children make Venn diagrams showing intersection of common factors.

C. Let's Play Games in Mathematics - Book V - Game number 3. Computer-Input--On 3 x 5 cards write problems to name greatest common factors of 2 numerals. Child writes answers on 3 x 5 card and put through Output slot. As long as the "computer" is able to answer the questions correctly he remains behind the cardboard. If he makes a mistake (or has 5 correct answers), he is replaced by the person posing that problem.

D. Let's Play Games in Mathematics - Game 14. Are there any common factors?

Level: 13 Step: B Concept: Sets

Text References:

Book: 4

Addison-Wesley (1971, 1968) p. 237

Book: 5

Houghton Mifflin (1967) pp. 164-167, (42)
Houghton Mifflin (1972) pp. 158-161, 168, 171
Addison-Wesley (1971, 1968) pp. 168-169

Book: 6

Houghton Mifflin (1967) pp. 173, (38), 175, (39)
Houghton Mifflin (1972) pp. 164, 165, 344 (42)
Addison-Wesley (1971, 1968) pp. 179, 180, (33), 87

Book: 7

Houghton Mifflin (1967) pp. 235-239, (36)
Houghton Mifflin (1972) pp. 165, 170
Addison-Wesley (1971) pp. 145-146, (28)

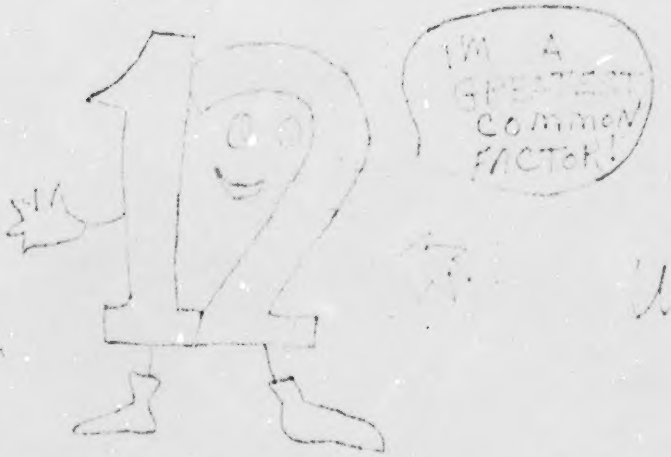
Other References:

Modern Math Filmstrip #761

* Suggested introductory activity

Level: 13
Step: B

WORKSHEET: SETS


I'M A GREATEST COMMON FACTOR!

Where do I belong?

LIST FACTORS AND NAME GCF FOR EACH PAIR:

1. 24

   36

2. 16

   32

3. 50

   45

4. 60

   48

5. 18

   45

6. 90

   75

7. 42.

   60

8. 54

   49

9. 33

   36

10. 84

    72

11. 34

    51

12. 48

    80

Level: 13
Step: B

WORKSHEET: SETS

WRITE FACTORS OF EACH.

SHOW COMMON FACTORS USING A VENN DIAGRAM.

WHAT IS THE GREATEST COMMON FACTOR?

1. 12

   8

2. 18

   30

3. 15

   20

4. 36

   24

5. 21

   27

6. 32

   72

7. 42

   60

8. 100

   200

9. 18

   36

10. 25

    60

Level: 13 Step: B Concept: Numeral

I. Concept:

Numeral: Finding prime factors by using a factor tree.

II. Behavioral Objective:

The student can use a factor tree to list the factors of a given number.

III. Mathematical Ideas:

A. If a factor of a whole number is prime, it is called a prime factor.

B. The arrangement of prime factors to form a branching pattern is called a factor tree.

IV. Vocabulary to Stress: primes - factor - factorization

V. Activities:

A. Let's Play Games in Mathematics - #35 (Factor Pyramid)

Text References:

Book: 4

Houghton Mifflin (1967) pp. 204-205
Houghton Mifflin (1972) pp. 170-171

Book: 5

Houghton Mifflin (1967) pp. 174, 175 (part of page)
Houghton Mifflin (1972) pp. 168-171, (44)
Addison-Wesley (1971, 1968) pp. 162, 163, 164, 165

Book: 6

Houghton Mifflin (1967) pp. 171, (38)
Houghton Mifflin (1972) pp. 160, 161, (41)
Addison-Wesley (1971, 1968) pp. 83, 85

Book: 7

Houghton Mifflin (1972) p. 160

Book: 8

Houghton Mifflin (1972) p. 160

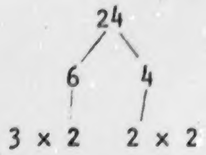
Other References:

Imperial Tape #16 (Intermediate)
Modern Math Filmstrip #751.

Level: 13 Step: B Concept: Numeral

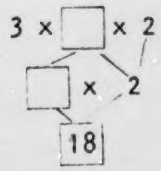
WORKSHEET: Prime Factorization

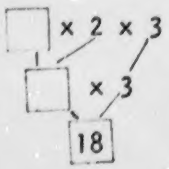
1. Here is one factor tree for 24

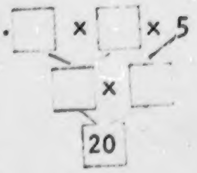

24
6
4
3 x 2
2 x 2

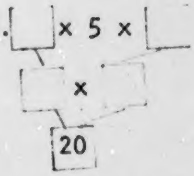
Make another factor tree for 24 different from this.

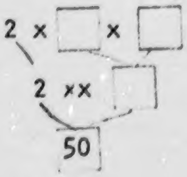
2. Fill in boxes:

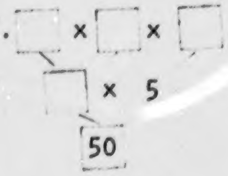
A.


B.


C.


D.


E.


F.


3. Draw a factor tree for:

A. 45

B. 28

C. C. 16

D. 70

Level: 13 Step: B Concept: Addition

I. Concept:

Addition: Finding the sum of fractional numerals with one addend greater than 1.

II. Behavioral Objective:

The student given 2 fractional numerals with one addend greater than 1, will be able to compute the sum.

III. Mathematical Ideas:

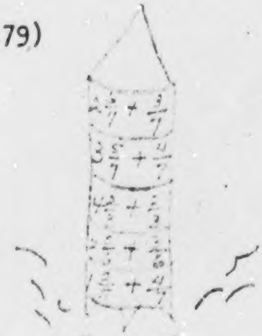
A. Every fractional number has many names.

B. A fractional number may be expressed as a fraction, an expanded numeral, or as a mixed numeral.

IV. Vocabulary to Stress: fractional numeral equivalent fractions

V. Activities:

A. Play "Blast Off" - (Houghton Mifflin T. Ed. 5, p. T279) Each team of 5 players is given a rocket (giving one problem for each member of the team.) Each team lines up, the first in line works bottom problem, second child, the next one up, etc. The first team to do all five additions calls "Blast Off!" The other students should check the sums. The first team to do all five additions correctly are named "Astronauts of the Day."



B. Draw Equivalent Fractions---two people. Materials needed for this game include at least 24 cards about the size of ordinary playing cards. Write the name of a fractional number on each card and choose the names so that exactly two different cards represent each different fraction.

Play begins when one of the players turns up a pair of cards (any two). If he thinks they name the same number he keeps the two cards, unless his opponent shows that the fractions are not equivalent. If he fails to turn up equivalent fractions he must return the cards to the deck and allow his opponent to draw any 2 cards. If the fractions are equivalent, the drawer keeps the cards. If not, they must be returned to the deck. Play continues until all cards have been used. (paired)

The player keeping the most cards is the winner.

Level: 13 Step: B Concept: Addition

Text References:

Book: 4

Houghton Mifflin (1967)

Book: 5

Houghton Mifflin (1967) (62)
Houghton Mifflin (1972) pp. 193, 208, 211, 212, 217
Addison-Wesley (1971, 1968) p. 243

Book: 6

Houghton Mifflin (1972) pp. 194-197, (47) part of this

Book: 7

Houghton Mifflin (1967) pp. 345-349, (52) part of this
Addison-Wesley (1971) pp. 225, (43)

Other References:

Imperial Tape #20 (Intermediate)

Level: 13 Step: B Concept: Addition

WORKSHEET: ADDITION

Express answer as a mixed numeral in simplest form.

1. $\begin{array}{r} 3\frac{4}{5} \\ +\ \frac{1}{4} \\ \hline \end{array}$

2. $\begin{array}{r} 4\frac{7}{8} \\ +\ \frac{1}{4} \\ \hline \end{array}$

3. $\begin{array}{r} 8\frac{4}{5} \\ +\ \frac{1}{10} \\ \hline \end{array}$

4. $\begin{array}{r} 6\frac{3}{4} \\ +\ \frac{1}{2} \\ \hline \end{array}$

5. $\begin{array}{r} 4\frac{1}{6} \\ +\ \frac{2}{3} \\ \hline \end{array}$

6. $\begin{array}{r} 5\frac{1}{2} \\ +\ \frac{3}{4} \\ \hline \end{array}$

7. $\begin{array}{r} 8\frac{1}{3} \\ +\ \frac{1}{2} \\ \hline \end{array}$

8. $\begin{array}{r} 9\frac{1}{6} \\ +\ \frac{1}{3} \\ \hline \end{array}$

9. $\begin{array}{r} 9\frac{7}{8} \\ +\ \frac{8}{12} \\ \hline \end{array}$

10. $\begin{array}{r} 4\frac{3}{4} \\ +\ \frac{5}{6} \\ \hline \end{array}$

11. $\begin{array}{r} 11\frac{1}{3} \\ +\ \frac{2}{9} \\ \hline \end{array}$

12. $\begin{array}{r} 17\frac{3}{4} \\ +\ \frac{1}{3} \\ \hline \end{array}$

13. Jack spent $\frac{3}{4}$ hour in the morning working on his car. That evening he worked on it $3\frac{3}{4}$ hours. How many hours did he work on the car that day?

14. Mary used $\frac{2}{3}$ skein of yarn for knitting a cap and $1\frac{4}{5}$ skeins for a scarf. How much yarn did she use in all?

15. Ruth used $5\frac{2}{3}$ cups of sugar for her cookies. Jane used $\frac{3}{4}$ cup of sugar for her cake. How much sugar did the girls use all together?

Level: 13 Step: B Concept: Subtraction

I. Concept:

Subtraction: Subtraction of mixed numerals without regrouping.

II. Behavioral Objective:

The student given 2 mixed numerals will be able to compute the difference in simplest form.

III. Mathematical Ideas:

A. A fractional number greater than 1 may be expressed as a fraction, an expanded numeral, or a mixed numeral.

IV. Vocabulary to Stress:

mixed numeral	simplest form
expanded numeral	equivalent

V. Activities:

A. Game--Action Fractions.

B. Use felt fractional parts to show equivalent fractions.

C. Let's Play Games in Mathematics (5) - #64 (Tic-Tac Fractions)

Text References:

Book: 5

Houghton Mifflin (1967) pp. 232, 233, (62, 63)
Houghton Mifflin (1972) pp. 209, (54),212 (part)
Addison-Wesley (1971, 1968) pp. 234, 235, (47, 48, 49) (part)

Other References:

Imperial Tape #21 (Intermediate)

Level: 13 Step: B Concept: Subtraction

WORKSHEET

Find the difference. Write answers in simplest form.

1. $\begin{array}{r} 3\frac{6}{7} \\ -\ 1\frac{4}{7} \\ \hline \end{array}$

2. $\begin{array}{r} 9\frac{7}{9} \\ -\ 3\frac{2}{3} \\ \hline \end{array}$

3. $\begin{array}{r} 4\frac{11}{12} \\ -\ 1\frac{1}{3} \\ \hline \end{array}$

4. $\begin{array}{r} 5\frac{6}{8} \\ -\ 3\frac{1}{3} \\ \hline \end{array}$

5. $\begin{array}{r} 9\frac{13}{16} \\ -\ 7\frac{1}{4} \\ \hline \end{array}$

6. $\begin{array}{r} 11\frac{15}{18} \\ -\ 5\frac{1}{6} \\ \hline \end{array}$

7. $\begin{array}{r} 12\frac{6}{9} \\ -\ 10\frac{1}{18} \\ \hline \end{array}$

8. $\begin{array}{r} 13\frac{4}{5} \\ -\ 3\frac{1}{15} \\ \hline \end{array}$

9. $\begin{array}{r} 15\frac{8}{10} \\ -\ 5\frac{4}{10} \\ \hline \end{array}$

10. $\begin{array}{r} 17\frac{6}{15} \\ -\ 14\frac{5}{15} \\ \hline \end{array}$

11. $\begin{array}{r} 15\frac{7}{13} \\ -\ 10\frac{4}{13} \\ \hline \end{array}$

12. $\begin{array}{r} 7\frac{5}{6} \\ -\ 4\frac{1}{3} \\ \hline \end{array}$

13. $\begin{array}{r} 16\frac{5}{9} \\ -\ 6\frac{1}{3} \\ \hline \end{array}$

14. $\begin{array}{r} 5\frac{3}{4} \\ -\ 1\frac{1}{2} \\ \hline \end{array}$

15. $\begin{array}{r} 7\frac{7}{8} \\ -\ 3\frac{1}{4} \\ \hline \end{array}$

16. $\begin{array}{r} 9\frac{7}{10} \\ -\ 7\frac{2}{5} \\ \hline \end{array}$

17. $\begin{array}{r} 4\frac{11}{14} \\ -\ 1\frac{1}{7} \\ \hline \end{array}$

18. $\begin{array}{r} 13\frac{7}{11} \\ -\ 11\frac{5}{11} \\ \hline \end{array}$

19. $\begin{array}{r} 9\frac{3}{5} \\ -\ 7\frac{1}{10} \\ \hline \end{array}$

20. $\begin{array}{r} 8\frac{7}{8} \\ -\ 4\frac{1}{12} \\ \hline \end{array}$

Level: 13 Step: B Concept: Multiplication

I. Concept:

Multiplication: Solving multiplication in word problems with n- place factors.

II. Behavioral Objective:

The student given a word problem involving multiplication with n- place factors will be able to solve the problem.

III. Mathematical Ideas:

A. Multiplication is commutative.

B. Multiplication is associative.

IV. Activities:

A. Put a word problem on board just before recess. Those who find the correct answer go first.

Text References:

Book: 4

Addison-Wesley (1971, 1968) p. 189

Book: 5

Houghton Mifflin (1967) pp. 111, 112-113, (33)
Houghton Mifflin (1972) p. 235
Addison-Wesley (1971, 1968) pp. 117-119, (29), 203

Book: 6

Houghton Mifflin (1967) pp. 48, 50, 100, 106

Book: 7

Houghton Mifflin (1967) pp. 74-75
Addison-Wesley (1971) p. 57

Level: 13 Step: B Concept: Multiplication

WORKSHEET

1. A baby elephant might weigh 196 pounds. A full-grown elephant would weigh 57 times that much. How much would the full-grown elephant weigh?

2. A full-grown whale weighs 954 times as much as a baby elephant. How much would this whale weigh?

3. Another whale weighs 47 times as much as the beauty queen who weighs 118 pounds. How much does this whale weigh?

4. An astronaut traveled 5957 miles in space. If it is 718 times that far to planet Spark, how far is it to Spark?

5. A Martian traveled 7857 miles round trip to planet Spark. How many miles did he travel in making 37 trips to Spark?

Level: 13 Step: B

WORKSHEET: MULTIPLICATION

1. A car of the future may travel 125 miles per hour. How far will it travel in 78 hours?

2. Bill has 78 stamps on each page of his stamp album. The album has 78 pages. How many stamps does he have?

3. There are how many days in 56 years?

4. There are how many pounds in 7 tons of crushed rock?

5. If the average weight of a man is 178 pounds, how much would 57 men weigh?

6. If I save 129 dollars each month, how much can I save in 1 year?

Level: 13 Step: B Concept: Division

I. Concept:

Division: Applying the divisibility rules to determine if a multiple is divisible by 2, 3, 4, 5, 6, 9, or 10.

II. Behavioral Objective:

The student given a numeral will be able to determine if it is divisible by 2, 3, 4, 5, 6, 9, or 10.

III. Mathematical ideas:

A. A number is divisble by two if its one's digit is an even number.

B. A number is divisble by 3 if the sum of its digits is divisible by 3.

C. A number is divisible by 4 if the total value of the one's and ten's digits is divisible by 4.

D. A number is divisible by 5 of its one's digit is 0 or 5.

E. A number is divisible by 6 if it is divisible by 2 and 3. Its one's digit must be an even number and the sum of its digits must be a multiple of 3.

F. A number is divisible by 9 if the sum of its digits is divisible by 9.

G. A number is divisible by 10 if its one's digit is 0.

IV. Vocabulary to Stress: divisibility multiple

V. Activities:

A. Simon says. Each child is given a card with a number on it (2, 3, 4, 5, 6, 9, or 10). All players put hands on desk with thumbs down, keeping their number a secret. The leader calls a number between one and a hundred. Players put thumbs up if his number will divide the called number without a remainder. If you wish to play in teams, a correct answer is scored one point. Change cards frequently.

Level: 13 Step: B Concept: Division

Text References:

Book: 5

Houghton Mifflin (1967) pp. 182, 183, 184, 185
Houghton Mifflin (1972) pp. 174-177, (45)

Book: 6

Houghton Mifflin (1967) pp. 180-182, (40)
Houghton Mifflin (1972) pp. 172-174
Addison-Wesley (1971, 1968) p. 82

Book: 7

Houghton Mifflin (1967) pp. 227-230, (34), 245, 221-230, 245, (34)
Houghton Mifflin (1972) pp. 174-177

Book: 8

Addison-Wesley (1971) pp. 109-112

Level: 13 Step: B Concept: Geometry

I. Concept:

Geometry: Naming the perimeter of a polygon by adding the measures of the sides of the polygon.

II. Behavioral Objective:

The student given the measures of the sides of a polygon will be able to compute the perimeter.

III. Mathematical Ideas:

A. The perimeter of a polygon is the sum of the measurements of its sides.

B. Measurement of line segments involves linear measure.

IV. Vocabulary to Stress: perimeter - polygon - linear measure

V. Activities:

A. Teacher's Edition, Imperial Tapes, Lesson 37 (Intermediate)

B. AW5, pp. 96-97.

* C. Have the students find the perimeter of various objects in the classroom. (Desk, math book cover, etc.)

* D. Have committee measure perimeter of ball diamond, or section of playground.

E. Geoboard Activity 15.

Text References:

Book: 4

Houghton Mifflin (1972) p. 289
Addison-Wesley (1971,1968) pp. 124-127

Book: 5

Houghton Mifflin (1967) pp. 69, 78, (20)
Houghton Mifflin (1972) pp. 305 (mixed with area)
Addison-Wesley (1971, 1968) pp. 96-97, 117, (15), 156-157

Book: 6

Houghton Mifflin (1972) pp. 95, 6-9
Houghton Mifflin (1967) pp. 74
Addison-Wesley (1971, 1968) pp. 107

Level: 13 Step: B Concept: Geometry

Text References: (continued)

Book: 7

Houghton Mifflin (1967) pp. 414-416, (65)
Houghton Mifflin (1972) p. 115
Addison-Wesley (1971) pp. 134-136, (25)

Other References:

Imperial Tape #37 (Intermediate)

Franklin Series: Learning About Measurements, pp. 26-31

Mathematics in the Making 1, Pattern, Area and Perimeter

Forms We See (Filmstrip and Tape) #EF1106-3 Quadrilaterals

* Suggested introductory activity

Level: 13 Step: B Concept: Geometry

WORKSHEET

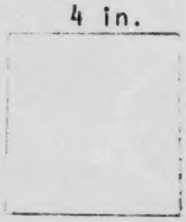
Name the perimeter of:

1. A pentagon whose sides are 15 ft., 13 ft., 9 ft., 6 ft., and 5 ft.__________

2. A triangle whose sides are 14 ft., 8 ft., and 10 ft.__________

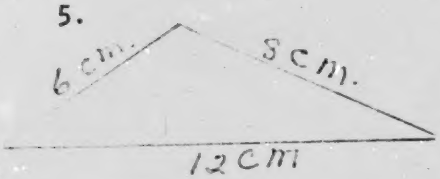
3. A quadrilateral whose sides are 23 ft., 15 ft., 27 ft., and 19 ft.__________

4. Find the perimeter of the square.



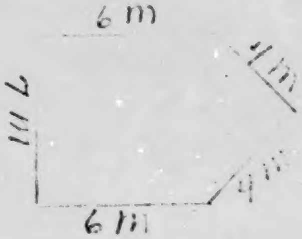
Name the perimeters of each figure.

5.


6 cm.
8 cm.
12 cm

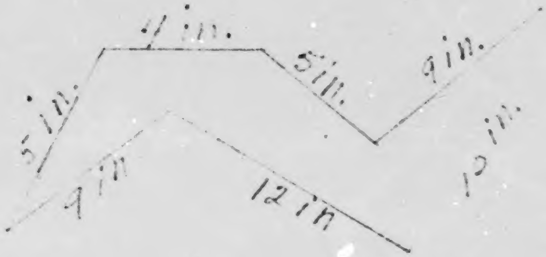
____

6.


6 m
4 m
7 m
4 m
6 m

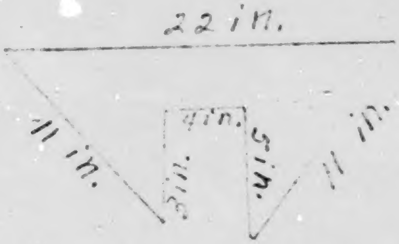
____

7.


4 in.
5 in.
9 in.
5 in.
4 in
12 in
12 in.

____

8.


22 in.
11 in.
4 in.
3 in.
5 in.
11 in.

____

9. The perimeter of a rectangle is 12 feet. One side is 4 ft. What is the length of each of the other sides?

10. The perimeter of a square is 20 ft. What is the length of each side?

Level: 13 Step: B Concept: Measurement

I. Concept:

Measurement: Finding the median from unranked data.

II. Behavioral Objective:

The student given a list of numerals to arrange in order of magnitude will be able to find the median.

III. Mathematical Ideas:

A. Median is the middle when data is arranged in order of magnitude.

B. Given an even number of numerals the median will be the average of the 2 middle numerals.

IV. Vocabulary to Stress: order - magnitude - data

V. Activities:

A. Have children find the median of their scores on 6 Spelling Tests.

B. Measure height of boys and girls. Find median for boys and median for girls and median for all.

Text References:

Book: 5

Houghton Mifflin (1967) pp. 156-159, (41) (mixed with average)
Houghton Mifflin (1972) pp. 227, 229, (57)

Book: 6

Houghton Mifflin (1972) p. 75
Houghton Mifflin (1967) p. 120
Addison-Wesley (1971, 1968) pp. 106-107

Book: 7

Houghton Mifflin (1967) pp. 492-494
Houghton Mifflin (1972) pp. 238-239

Book: 8

Addison-Wesley (1971) pp. 229-231

Level: 13 Step: A

ANSWERS TO WORKSHEET

13-2

Starting at Columbia and going to London the answers should read:

7: 0, 7, 14, 21, 28, 35

3: 0, 6, 9, 12, 15, 18, 21, 24 LCM 21

9: 0, 9, 18, 27, 36, 45,

4: 0, 4, 8, 12, 16, 20, 24, 28, 32, 36 LCM 36

5: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45

3: 0, 3, 6, 9, 12, 15, 18, 21, 24, 27 LCM 15

6: 0, 6, 12, 18, 24, 30, 36, 42

4: 0, 4, 8, 12, 16, 20, 24, 28, 32 LCM 12

7: 0, 7, 14, 21, 28, 35, 42, 49

4: 0, 4, 8, 12, 16, 20, 24, 28 LCM 28

8: 0, 8, 16, 24, 32, 40, 48

5: 0, 5, 10, 15, 20, 25, 30, 35, 40 LCM 40

9: 0, 9, 18, 27, 36, 45

3: 0, 3, 6, 9, 12, 15, 18, 21, 24 LCM 18

12: 0, 12, 24, 36, 48

8: 0, 8, 16, 24, 32, 40, 48 LCM 24

6: 0, 6, 12, 18, 24, 30, 36

10: 0, 10, 20, 30, 40, 50, LCM 30

8: 0, 8, 16, 24, 32, 40, 48

6: 0, 6, 12, 18, 24, 30, 36 LCM 24

Level: 13 ANSWERS TO WORKSHEET

13-13

Pentagons 4, 5

Hexagons 2, 6

13-16

1. 10

2. 2

3. 3 dm. 4 cm

4. 10

5. 100

6. 100

7. 3

8. $\frac{1}{100}$

9. 1000

10. $\frac{1}{10}$

11. 2

13-17

1. 10 dm.

2. 70 dm.

3. 1000 mm.

4. 100 cm.

5. 10 mm.

6. 800 dm.

7. dm.

8. 500 mm.

9. 5000 cm.

10. 300 mm.

Level

ANSWERS TO WORKSHEETS

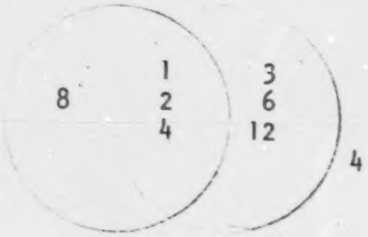
13-20

GCF:

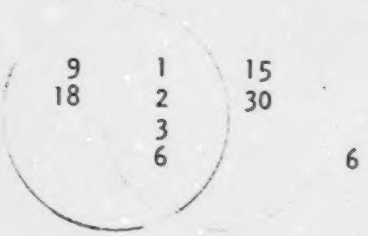
1. 12
2. 16
3. 5
4. 12
5. 9
6. 15
7. 6
8. 1
9. 3
10. 12
11. 17
12. 8

13-21

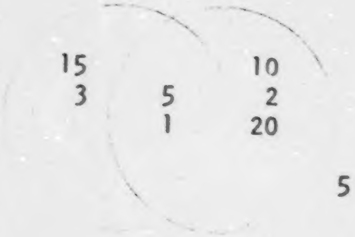
1.



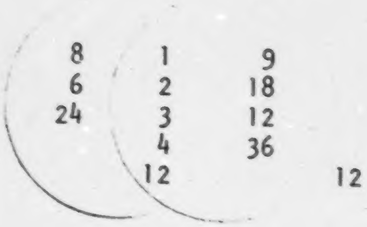
2.


9
18
1
2
3
6
15
30
6

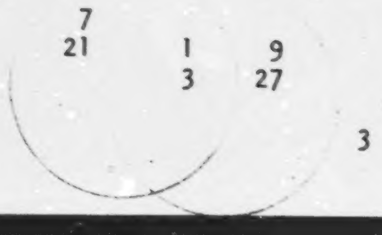
3.


15
3
5
1
10
2
20
5

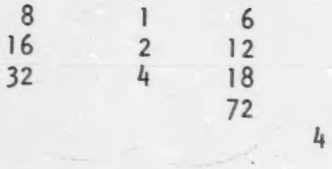
4.


8
6
24
1
2
3
4
12
9
18
12
36
12

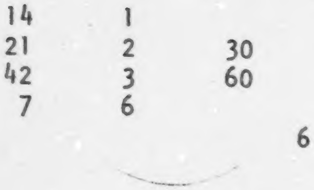
5.



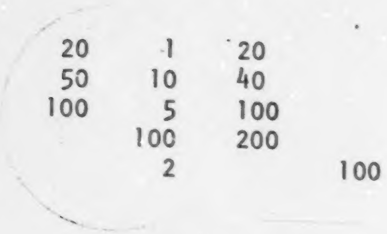
6.


8
16
32
1
2
4
6
12
18
72
4

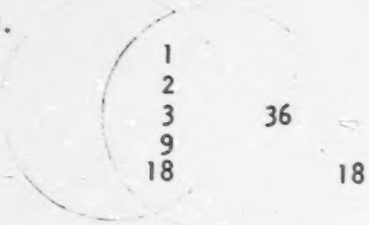
7.


14
21
42
7
1
2
3
6
30
60
6

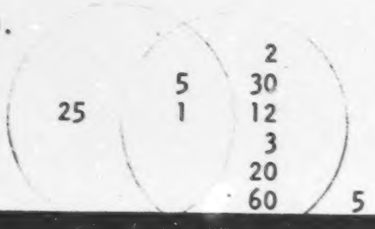
8.


20
50
100
1
10
5
100
2
20
40
100
200
100

9.


1
2
3
9
18
36
18

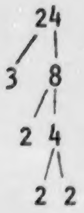
10.


25
5
1
2
30
12
3
20
60
5

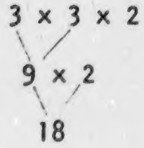
Level: 13 ANSWERS TO WORKSHEET

13-23

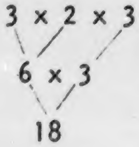
1. Possible:



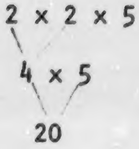
2. A.



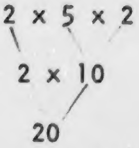
B.



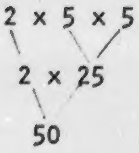
C.



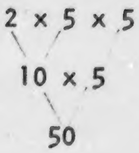
D.



E.

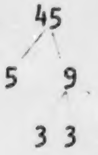


F.

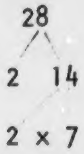


3. Possible answers:

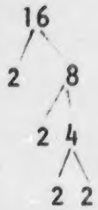
A.



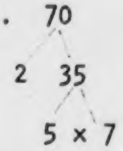
B.



C.



D.



Level: 13 ANSWER TO WORKSHEET

13-26

1. $4\frac{1}{20}$
2. $8\frac{1}{8}$
3. $8\frac{9}{10}$
4. $7\frac{1}{4}$
5. $4\frac{5}{6}$
6. $6\frac{1}{4}$
7. $8\frac{5}{6}$
8. $9\frac{1}{2}$
9. $10\frac{13}{24}$
10. $5\frac{7}{12}$
11. $11\frac{5}{9}$
12. $18\frac{1}{12}$
13. $4\frac{1}{2}$
14. $2\frac{7}{15}$
15. $6\frac{5}{12}$

13-28

1. $2\frac{2}{7}$
2. $6\frac{1}{9}$
3. $3\frac{7}{12}$
4. $2\frac{5}{12}$
5. $2\frac{9}{16}$
6. $6\frac{2}{3}$
7. $2\frac{11}{18}$
8. $10\frac{11}{15}$
9. $10\frac{2}{5}$
10. $3\frac{1}{15}$
11. $5\frac{3}{13}$
12. $3\frac{1}{2}$
13. $10\frac{2}{9}$
14. $4\frac{1}{4}$
15. $4\frac{5}{8}$
16. $2\frac{3}{10}$
17. $3\frac{9}{14}$
18. $2\frac{2}{11}$
19. $2\frac{1}{2}$
20. $4\frac{19}{24}$

Level: 13 ANSWERS TO WORKSHEET

13-30

1. 11, 172 lbs.
2. 186,984 lbs.
3. 5,546 lbs.
4. 4,277,126 miles
5. 290,709 miles

13-31

1. 9,750 miles
2. 6,084 stamps
3. 20,440 days
4. 14,000 lbs.
5. 10,146 lbs.
6. $15.48

13-36

1. 48 ft.
2. 32 ft.
3. 84 ft.
4. 16 in.
5. 26 cm.
6. 27 m.
7. 54 in.
8. 56 in.
9. 4 ft.; 2 ft.; 2 ft.
10. 5 ft.

Level 13 ANSWER SHEET - POST TEST I

Step A - Sets

1. 9
2. 30
3. 40
4. 4
5. 6

Step A - Addition

6. a $1\frac{1}{6}$
7. c $\frac{13}{20}$
8. d $\frac{13}{18}$
9. a $\frac{3}{4}$
10. b $\frac{13}{14}$

Step A - Subtraction

11. $\frac{5}{12}$
12. $\frac{17}{24}$
13. $\frac{8}{21}$
14. $\frac{19}{30}$
15. $\frac{5}{24}$

Step A - Division

16. 38 r36
17. 205 r3
18. 143 r19
19. 155 r29
20. 116 r40

Step A - Geometry

21. b
22. b
23. b
24. c
25. b

Step A - Geometry

26. 100
27. 10
28. 10
29. 2 dm. 5 cm.
30. 600

Step B - Sets

31. GCF 2
32. 14
33. 18
34. 50
35. 8

Step B - Numeral

36. a
37. c
38. d
39. a
40. b

Step B - Addition

41. $4\frac{5}{6}$
42. $10\frac{1}{8}$
43. 4
44. $2\frac{2}{3}$
45. $8\frac{4}{5}$

Step B - Subtraction

46. 7
47. $2\frac{1}{2}$
48. $3\frac{3}{10}$
49. $8\frac{1}{6}$
50. $3\frac{7}{24}$

Step B - Multiplication

51. 1786 eggs
52. 3844 miles
53. 6239 pounds
54. 6864 peanuts
55. 24,935 miles

Step B - Division

56. b
57. c
58. c
59. a
60. c

Step B - Geometry

61. c
62. d
63. b
64. d
65. b

Step B - Measurement

66. 89°
67. $81\frac{1}{2}^\circ$
68. 84°
69. 110
70. 77°

Level: 13

ANSWER SHEET - POST TEST II

Step A - Sets

1. 12
2. 6
3. 24
4. 72
5. 30

Step A - Addition

6. $\frac{35}{36}$
7. $\frac{2}{3}$
8. $\frac{26}{35}$
9. $1\frac{1}{12}$
10. $\frac{9}{10}$

Step A - Subtraction

11. $\frac{5}{24}$
12. $\frac{1}{14}$
13. $\frac{1}{40}$
14. $\frac{1}{12}$
15. $\frac{11}{18}$

Step A - Division

16. 38 r16
17. 54 r42
18. 75 r63
19. 96 r18
20. 86 r32

Step A - Geometry

21. b
22. c
23. a
24. c
25. c

Step A - Measurement

26. c
27. c
28. b
29. a
30. d

Step B - Sets

31. 6
32. 4
33. 12
34. 9
35. 6

Step B- Numeral

36. 54
37. 27
38. 9
39. 3
40. a

Step B - Addition

41. $6\frac{1}{4}$
42. $9\frac{1}{2}$
43. $11\frac{1}{2}$
44. $4\frac{1}{2}$
45. $9\frac{7}{22}$

Step B - Subtraction

46. $1\frac{1}{2}$
47. $9\frac{1}{6}$
48. $12\frac{1}{6}$
49. $6\frac{3}{5}$
50. $7\frac{1}{2}$

Step B - Multiplication

51. 22,620
52. 31,850
53. 4,116
54. 1,143
55. 9,120

Step B - Division

56. 9
57. 6
58. 4
59. b
60. a

Step B - Geometry

61. b
62. a
63. c
64. c
65. d

Step B - Measurement

66. b
67. c
68. a
69. b
70. d